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THE

# BICYCLE

## ITS CARE and REPAIR

BY

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DELAWARE CITY, DEL.

U. S. A.

C. VON CULIN.

1896.

## PREFACE.

This little book is intended to help all who ride a wheel, to instruct the beginner how to ride, care for and repair the wheel.

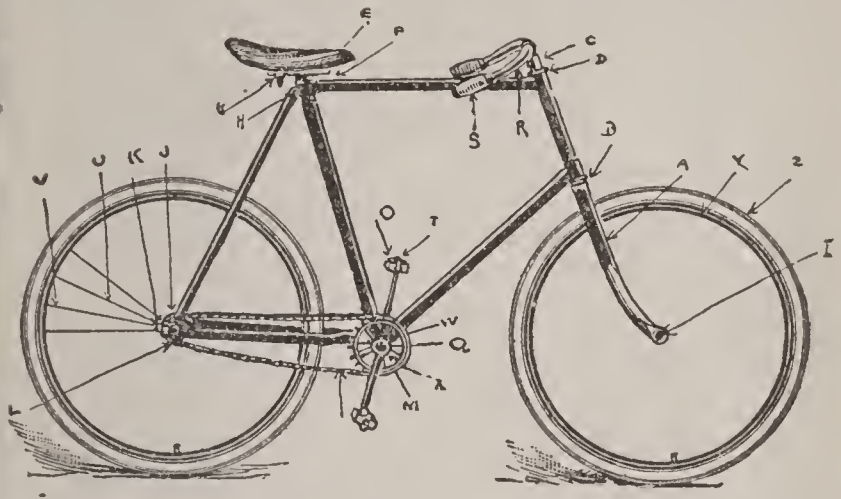
The dealer and repairman will find many useful tools, appliances and methods; the greater number being furnished by Wheel Talk, published by Morgan & Wright.

While this book is intended for the rider, dealer and repairman, it is also a great benefit to the manufacturers of both wheels and tires. By the proper care the rider saves his wheel, also the manufacturers the expense of the many free repairs, while the simple methods of repairs save the rider the inconvenience of waiting from four to six weeks for his wheel to be returned.

The need of such a book and the encouragement received from many manufacturers causes its birth.

C. VON CULIN.

# PARTS OF THE BICYCLE.




A, front fork; B, lower head cone; C, top collar and screws D, top collar cone; E, saddle; F, saddle post; G, saddle clamp and bolt; H, post clamp bolt; I, front wheel hub, axle, cones and nuts; J, rear wheel hub, axle, cones and nuts; K, chain adjustment, ring, plate and nuts; L, rear sprocket; M, front sprocket; N, chain; O, pedal; P, crank; Q, crank axle, cones, bushings, nuts, and lock nuts; R, handle bars; S, handle bar grip; T, pedal axle, cone and nut; U, spoke; V nipple; W, c. s. oil cup; X, crank key and nut; Y, rim; Z, tire.

## NOTICE TO MANUFACTURERS.

All future editions will be 50,000 copies. Advertising space should be engaged as early as possible for next edition, as only a limited number will be taken, to print six or eight more pages than the regular forms would cost more than I ask for the space. Write for prices. You do not pay for advertisement until you receive copy of book containing advertisement.

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**Repairmen and Wheelmen.**

Will be pleased to receive, sketches, photos, etc., of any appliances, tools etc., also, items of interest for future edition of this book.

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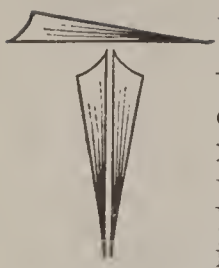
**Manufacturers, Dealers and Agents, write for wholesale prices.**

C. VON CULIN.

## The Care.



THE care of a bicycle is of greater importance than most persons think, the bicycle carries a greater weight with safety and stands more rough usage than any other vehicle made for its weight, because it is made of finer material and workmanship than other vehicles, does not mean that it needs no care, being a valuable article it is all the more important that it has the proper care. Keeping the nickel parts bright and enameled parts clean is all right but it is far from all that is necessary if you want an easy running wheel and one that will last well and not have to return to manufacturer or dealer the first three months. Even if the manufacturer will put in order free, because you did not know how to care for it, there is the inconvenience of waiting for its return [often from four to six weeks], you have the expense both ways, and then you have not as good a wheel as you would have had if properly cared for.

The rider should know when a wheel is properly adjusted, this will save much trouble and it will not be so apt to get out of order. What is meant by out of order is not broken or will not run, but when any one or more parts are not exactly right. If it does get out of order you will be better able to know what is the matter, and by refering to this book you will find explanations which will tell you what to do to find the trouble if you do not know, and how to remedy it after you find it.

The illustrations show many ways to repair all parts of the Bicycle, use the one which is the most convenient for you.

## Learning to Ride.

Any person who has the use of his limbs can learn to ride. In learning you must not

forget to care for your wheel. When possible hire or borrow an old wheel for first few days, that will be taking good care of YOUR wheel.

Set the seat about two inches lower than you can reach the pedal with your heel, when pedal is down.

Set handle bars three or four inches higher than seat, and see that they are screwed tight.

Secure pants legs and you are ready. Grasp handles lightly, do not try to squeeze them as you would a lemon.

Straddle wheel, with left foot on step, push wheel ahead of you a few times hopping along on your right foot. Increase the length of your steps or hops until you can ride with all your weight on step, letting your right foot hang so as to catch you when you are about to fall, in short: learn to ride on step first, practice at first on down grade if possible, [but not steep] pushing your wheel up grade. You will notice that you must always turn the wheel in the direction you are going to fall, put on speed and your wheel will come up again and as you come up straighten your course. After having control of the wheel on the step, gently slip into the saddle. Do not be in a hurry, take it easy, and you will learn by this method in one hour.

Another plan is to lower the saddle so your toes can reach the ground on both sides, by this plan old, delicate or very stout persons cannot fall to hurt themselves.

After you think you have learned to ride you have more to learn, such as riding with ease and comfort, leg and ankle motion, position of hands and arms, body motion without it being perceptible, not with a hop and a jump with every push.

To ride properly you must learn to balance the wheel, by the body. To run a straight course or to keep in a path the body must do the balancing by keeping the wheel plumb.

A wheelman scorching along with nose to the handle bar is not exemplifying the highest use of the wheel. The beauties of the country are not his. The green grass, wild flowers, the old spreading shade trees that may hedge his path, the half hidden brook and the grazing flocks that round out the beautiful aspect of the country in the summer are all unheeded. He sees but a dusty track, which he follows. and his trip is a bare record of miles.

The proper position for a bicycle rider is, in the first place, an upright one. He should push nearly straight downward with his legs--not backward, as one must do who leans far forward. His arms should not be rigid and extended to their full length, but a little bent, and the handles can be easily adjusted to bring this about. The reason for the bent or slightly bent arm is evident after a moment's thought. If the arm is stiff, rigid and extended to its full length there is no life in it. Each jar to the machine is a jar to your body, your head and neck, and consequently a jar to your whole system. On the other hand, if you ride with your arms a little bent, and acting as a kind of a buffer to all jarring influences, they will save you an injurious, though unnoticeable, shaking up each time you go out. The only way in which you will notice a change will be after you have become accustomed to the bent arm method. Then you will find you can ride longer without becoming tired.

Another feature of this stiff arm is the position into which the shoulders are thrust. Try it; grow a little tired with a long ride and see where your shoulders are. You have gradually come to lean on your arms for rest. Both shoulders have been thrown back; your head and neck are stretched far forward, and your chest has, so to speak, sagged forward

out of its natural position. The weight of your body should not come on the hands and arms except for an occasional change, head winds, up hills and scorching or racing, but on your thighs, and thence be transferred to the seat, which in a measure allows some of the weight to come on the pedals. In this position your hands are free to guide your wheel, your body is erect; you do not then get into the habit of swaying from side to side to put your weight first on one side and then on the other; and your whole muscular movement is regular and normal. Try riding without putting either hand on the handles and sitting erect. If you ride well, you can easily keep your balance, and in an instant you will be in the correct position. Once in this position, place the hands lightly on the handle bars, and you will be in a healthy, a proper situation to gain benefit from your riding.

### Light Wheels.

The lightest wheel is not always the fastest. Lack of rigidity will often tend to decrease the speed of a machine far more than the addition of a few pounds to its weight. Only machines of the highest grade can with safety be made very light, and even then a very light machine is only to be recommended to a careful and expert rider who will nurse it over rough roads and bad ones. Light wheels, even though they may not break down in one season's riding, will not last so long as heavier ones of the same quality, and are more easily damaged by falls. The minimum weight which can be safely ridden depends upon the character of the roads upon whichit is to be used, as well as upon the the weight and skill of the man who is to ride. Beginners will find safety and comfort, too, selecting a wheel which weighs a few pounds more than the lightest. Too much weight is bad; too little weight much worse.

### To Ride a Featherweight.

A featherweight has to be ridden with great discretion, and humored in every way. A clumsy rider will never be able to ride it with safety, and a reckless rider will find it a death trap. One's seat is, perhaps, the most vital point. If the rider sits like a dead weight in the saddle, he will, no matter how light he may be, break up his mount in a very short time. He must be sympathetic. He must sit lightly, resting a proportion of his weight on pedals and handles, and ready at any moment to automatically ease that portion of the machine which is subjected to a sudden shock. For example, should he strike a heap of stones in the dark, he should be able instantaneously and instinctively to raise his front wheel slightly, thereby easing it of the weight, and he should then lean on pedals and handles, and by shifting the weight again relieve the back wheel of the strain of ploughing through the stones. Even when his back wheel strikes a stone he should, by throwing his weight forward, be able to lessen the shock, or even make it glance off the obstrucion without surmounting it. He should, in fact, be part and parcel of his machine, responding with lissomeness to its every movement. Sudden wrenches, such as a deep rut gives, should be avoided; hills almost beyond one's powers, shold not be attempted; and down grades should never be coasted; for, with feet up, it is impossible to sit otherwise than as a dead weight. A featherweight is seldom the same again after a severe smash, and consequently every precaution should be taken.

### Bearings; How Tight.

When with a slight pressure of the thumb and forefinger you can detect a very slight side play in the wheel or cranks, the bearings are about right; but when they can be freely shaken, they need tightening.

### Comparative Running Qualities.

There is no occasion for a rider to be uneasy in his mind because his back wheel will not revolve, when lifted off the ground, as long as somebody else's. This test is a very indifferent guide to the comparative running qualities of two machines. One reason, of course, is that so much depends on the rigidity of the frame. No matter how freely a wheel revolves when no pressure is applied to the pedals, the machine will not run easily in actual use if the pressure on the pedals throws the chain wheel out of line, while any want of rigidity in the cranks, the chain or the spokes will also mean a loss of power. A poor chain, too, may run freely when loose, but not when power is applied. Then, again, the length of time a wheel will revolve when off the ground depends very much upon the weight of the tire and rim, and perhaps partly on the weight of the pedals. A wheel fitted with light racing tire will not revolve as long as one fitted with a heavy roadster. But there is another reason, namely, that some of the forces which oppose the revolution of the wheel are increased by the weight of the rider in the saddle. while others are not. Suppose there are two machines, and the back wheel of neither of them will revolve freely; but in one case this is due to friction in the hub bearings, while in the other case it is due to a leather gear case touching the spokes. The weight of the rider will make no difference to the pressure of the leather against the spokes, and this slight retarding force will be very little noticed in actual riding; but the friction in the bearings, being enormously increased by the rider's weight, will become a serious matter.

### To Clean a Chain.

Take can or tin box large enough to coil chain and place in can; pour in gasoline to

cover chain; put on a tight fitting cover and shake it for a few minutes. Pour off gasoline and repeat once. In five minutes this will clean any chain perfectly. Oil well and work it in; now wipe dry and put on graphite, and chain will run smoothly. Do not use gasoline in room with light or fire, if at night use kerosine oil instead of gasoline, every time.

### CEMENTING TIRE ON RIMS,

To cement a tire to any kind of a rim without heating the cement is by taking hard red cement, grind as finely as possible and let it stand for several hours in a large mouthed bottle, first having covered with benzine. An occasional shaking should be given it, until the cement is thoroughly dissolved, when it is ready for use. The rim should be cleaned with a cloth saturated with benzine, and a heavy coat of the cement applied to the rim with a brush. Then apply benzine to the part of the tire that sets in the rim, put on the tire and inflate hard. A tire cemented on the rim in this manner seldom works loose. The application of cement will suffice for any number of tires, as once on the rim it always remains. To keep this cement, it should always be corked. And to prevent explosion, see that there is no fire or flame in the room.

### Smoking Lamp.

Never allow a bicycle lamp to smoke. Nothing is more disagreeable or more effectually ruins a lamp than smoking. This is almost invariably caused by having the wick turned too high. The light should be so regulated as to burn a clear, steady flame.

### THE WHEEL.

The wheel is the promoter of health; health is the twin sister of beauty, and both are closely related to happiness. And happiness—is next to heaven.

### Another Way To Clean a Chain.

Boil in a solution of cyanide of Potassium and water. It leaves it as clean as new. Be careful in using this solution, for it is very poisonous.

### How To Clean Bearings.

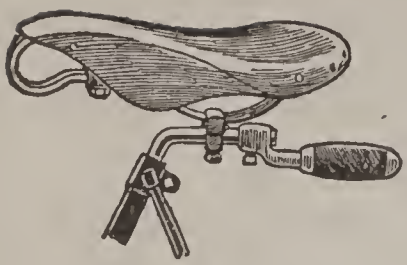
Remove the oil cups from the crank shaft box and flood the bearings with gasoline, at the same time spinning the cranks. The gasoline will cut loose and carry off any oil that has become gummy, and take with it dirt and sand. When the gasoline runs through the bearings, clear and white, the job is done. Let the wheel stand a few minutes for the gasoline to evaporate, then put on oil. Keep gasoline off the tire.

In many bicycles it is a difficult matter to flush the bearings of the crank shaft with kerosine, owing to the absence of or smallness of the oil hole; they can, however, be admirably flushed in most bicycles by removing the saddle post and pouring kerosene down the frame. The crank shaft should of course be rapidly rotated and the bicycle inclined from side to side.

### Cleaning and Oiling.

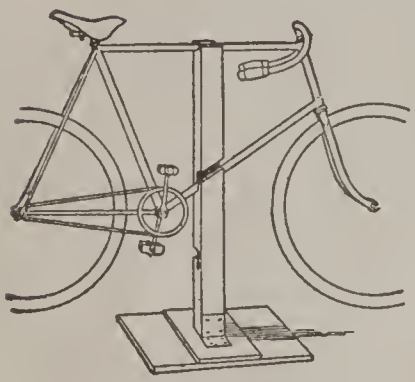
A wheel should be cleaned and oiled at least once a week. To clean the wheel, place the wheel upside down, resting on the saddle and the handle bar, which should rest on a cloth or piece of old carpet to prevent its being marred. Remove the dust from the wheel with a dry brush. If the rims and frames are muddy, use a wet cloth; a small brush will be found useful in cleaning the sand or mud from the hub or sprocket wheel. If the enamel of the frame appears streaked after washing off the mud, it should be rubbed with a dry piece of cloth or chamois skin. Do not use oily rags on the enameled parts. The spokes should be cleaned with a cloth.

A Bicycle Handle.



The object of this contrivance is to give the instructor something to "hang on to" while acting as a rudder to some fair novice.

A Bicycle Stand.



Just the thing on which to clean wheels, adjust bearings, repair tires, and to true up wheels when they are a little out. Other notches can be cut in the upright so that the wheel can be turned upside down Single notch to hold wheel while pumping it up with floor pump.

To Adjust Bearings.

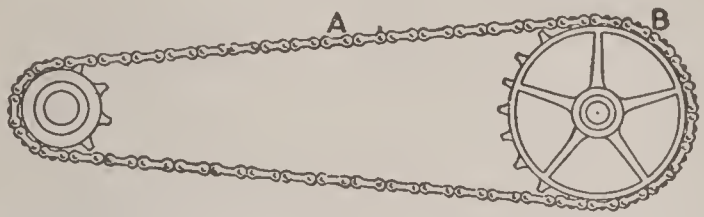
Slacken nuts on end of axle, then adjust cone so that wheel runs a little tight; gradually tighten nuts a little on end of axle. Back your cones from bearings against frame until wheel runs smoothly, and then tighten outside nuts to stay. It is nothing more than the principle of jam nut, yet it insures much finer adjustment.

VASELINE.

An expert in the manufacture of delicate scientific instruments and electric motors, says: "We experimented with many different oils in order to secure something that would not be affected by heat or cold, yet not too thin to run through the bearings. The conclusion we have come to is that the cheapest and best is vaseline, especially for ball bearings."

### To Join a Chain.

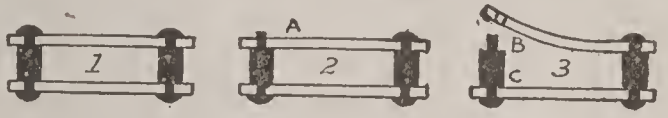
At A is where you will find a majority of riders will try to put the chain together.




Just draw the ends of chain back to B and see how easy it is to put a chain together.

### Adding a Link to a Chain.

First file around the head of rivet, as shown in A, Fig. 2, (do not file the head off), and then force off side of link, as in B, Fig. 3.




After the additional link has been inserted, Rivet C, Fig. 3, can then be reused.

### Saddles.

The position of the saddle depends much upon the height of the handle bars, when the handle bars are well up, the front of the saddle should be elevated a little to keep rider from slipping forward on the little end of the saddle, in proportion you lower the handle bar you lower the front end of saddle, but the same position is not comfortable for every one. The rider should change the position of saddle until comfortable, if after trying different positions it is not comfortable turn the wheel upside down (after having placed the saddle at the proper tilt), and sponge the under part of leather with hot water and soft soap for about a quarter of an hour. Then, having previously donned an ancient pair of breeches, dry the leather and take the machine for a ride of about twenty minutes, preferably over a rough road. This will cause the softened leather to mould itself to the shape of the body. The saddle

should then be left in a warm room for some hours in order to dry. Would advise for comfort, a saddle with spring. Old riders know what they want.

### Squeaking Saddles.

Most persons who have to do with bicyles are aware that the coils of some varieties of saddles are apt to rub together and cause a slight squeak, which is got rid of by touching any points of contact with oil, or preferably with vaseline. But there is another kind of sqeak with which some saddles are afflicted, often louder than that whieh comes from the springs, although the closest inspection may fail to reveal anything wrong, or any point where friction can be expected to take place. Under these circumstances, one may feel pretty sure that the noise comes from an infinitesimally slight movement of the leather on the framework of the saddle. Turn the wheel upside down and drop a little oil all around between the leather and framework and the noise will probably be heard no more, at all events for some months, till the oil has dried up, when the dose may be repeated.

### Front Forks.

The front fork should turn easily, not rattle or bind. The bearings are adjusted by the top cone and held in place by a lock nut, and should be examined often and oiled a little when oiling other bearings.

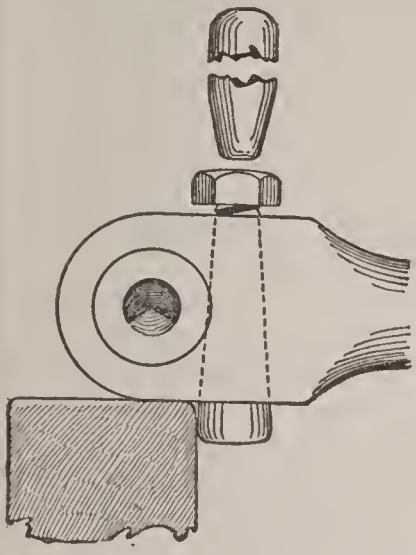
The front fork is a very important part of a bicycle, and should be examined often, its collapse is the most dangerous accident that can occur, except from a collision.

Manufacturers have so strengthened the forks in the past year, that seldom one collapses except from constant misuse.

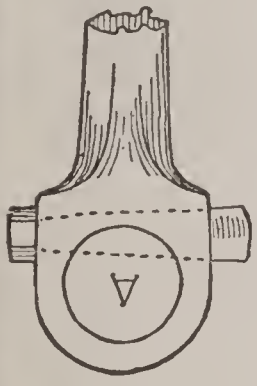
New wheels often leave the agency with front fork so tight that it is impossible to steer properly, and the beginner is apt to damage the wheel on this account.

### Removing Crank Key.

Turn nut back until one full thread shows inside the nut, and if key has become rusted, apply a drop of light oil or turpentine on each end. Then having previously made a short punch from a $\frac{3}{8}$-inch brass rod, tapered enough at one end to enter nut and set against threaded end of key, hold a block of babbit metal or copper against under side of crank close to head of key and strike a sharp blow with a light hammer.



### Crank Tightener.




To tighten a crank when worn so new pin will not take up play, take crank axle and turn smooth in lathe, then take crank and ream true, next turn a steel plug that will drive tight in hole [A] in crank; then braze and forge the size of crank axle. This works well on machines for which new cranks cannot be obtained."

### Why Spindles Get Bent.

The spindles or axles of the back and front wheels frequently get bent because the fork ends are not parallel, or because the nuts at the end of the spindle do not screw up flat against the fork ends. It may be that the outer side of the fork end, that is, the side facing away from the wheel, is not flat, or it may be that the nut is not made square and true. But in any case, when the nuts are

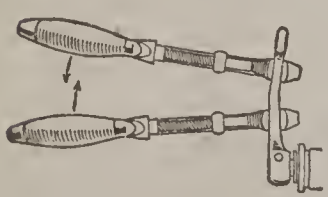
tightened up a great strain is put on the spindle, and want of attention to this seemingly small matter will explain a large proportion of otherwise unaccounted for bent spindles.

### TO STRAIGHTEN PEDAL PIN ON THE ROAD.

Remove the parts of the pedal except the shaft and leave this fastened to the crank. Then place a piece of wood under the shaft to relieve the shock, and strike the shaft carefully in the right direction.

If you can not remove pedal from parts for pin, place wood under crank as above, and hit pedal with board, or with stone, holding piece of wood on pedal to keep from battering. When you get home put it in good order. This may seem rough usage but something must be done when on the road.

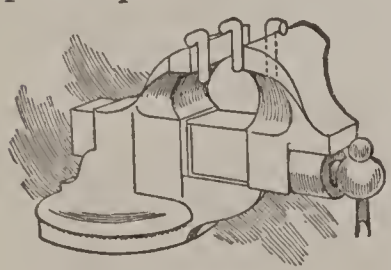
### CRANK STRAIGHTENER.



To straighten a crank without removing from the axle, take two 18-in. wrenches, fit firmly at either side of the bend. By using them as levers, the crank can be straightened to perfection.

### STRAIGHTENING CRANKS, PEDAL PINS, ETC.

Here is a device for straightening cranks, pedal pins and wheel axles: Get three pieces of soft brass or copper ½ or 5-8-inch square, long enough to reach the full length of face of vise and two inches to be bent over the top of jaws to prevent them from falling off. Place the crank or pedal pin between the three pieces, adjusting them to the bend, regardless of the threads as they will not be injured in the least. There is no danger of breaking them in this manner.



What is the matter with the wheel?

It rattles, or something binds, [a new wheel too], and I cannot see what it is. It pushes so hard, and I cannot steer it like some other wheels?

Some one if not all these questions are asked by the beginner, and by a great many who have used a wheel for a year.

Mr. B, W, or Z will tell you this that and the other thing, not knowing himself but guessing.

Granting you have started out with wheel in good order, running smooth and nice. To care for a wheel is to keep it in that shape. Having taken a long ride, but no falls or accidents, yet there is a rattle. Now to find the cause. Look at the seat, see that every bolt and nut is set up tight, especially the gooseneck or T, then the spring, the leather will stretch and often cause the spring to rattle or squeak, and the sound will often deceive you, being at the saddle will often sound at the foot. A drop of oil, a little tightening of leather, or a slight bend in the spiral spring will remedy it.

### A Jingling Sound.

A jingling sound often comes from the solder breaking loose where the spokes cross one another. Noticeable most when spokes are loose.

### A Clicking Sound.

A clicking sound, which is often taken for a broken ball, sand in the bearings or griping of the chain, [there may be a sound from either of these causes] when it is simply one or more loose spokes. Tighten the spokes, but be careful to keep the wheel in true while doing it, do not simply tighten the loose spokes regardless of the others or you will get it out of true. [See truing a wheel.]

### Pedals Rattling.

Take up the lost motion, or loosen as the case may be, so it will run smooth. Fasten by lock nut, or by the device provided, according to make of pedals.

### A Jogging Noise.

A jogging noise which is felt by the feet, is caused by a loose crank. The pin should be driven in and nut set up tight, or if cotter pin will not hold it firm because it is worn, put in a new pin.

### A Thumping Noise.

A thumping noise is often caused by a loose sprocket. Examine carefully, and if loose, tighten. The same noise and jar is made by a loose chain. The lost motion is felt more when the foot does not follow the pedal around. To test this keep your feet firm on pedals, following them around taking up the lost motion. If you can stop the noise by so doing, it is the loose chain. In this way you can tell if it is the chain or sprocket without getting off the wheel. There are many things about a wheel to rattle. Do not ride a rattling wheel.

### Broken Balls.

Occasionally a ball will break and it should be replaced at once, but examine all other parts first. Wherever you decide the broken ball is, examine that part first. If in wheel, take wheel out; if in crank axle, take off chain, unscrew cone and examine balls. Be careful in replacing to get the right number in each side. Do not drop any into the barrel, as we have found balls in the tubing which were dropped in when putting them in the crank axle. This was done at the factory when it was made, as it had never been apart, if they make mistakes you are apt to. This ball rattled for months and could not be located. To find a stray ball, or a chip of metal, or a hard loose lump of enamel in the tubing, turn the frame upside down, slowly.

### Front Wheel Axle.

Front wheel axle is sometimes broken or bent, caused by the nut or nuts getting loose, and going over rough ground especially going down hill, the front wheel will jump out of one side, bend or break the axle, and often the fork, possibly your neck.

See that the wheels are properly fastened in the forks. A nut that has never been loose, will, sometimes, after a year get loose.

### A Loose Washer.

A loose washer will often puzzle you, or a washer put in the wrong place, The washer should go between the cone and the nut, which is supposed to prevent the cones from turning when tightening the nuts.

### Rattling Tools.

Wrap tools so they will not rattle, or have a bag with pockets for each article.

Chain should not be tight, nor should it be so loose that it strikes the frame, or have much lost motion.

### Tight Bearings.

Tight bearings are generally caused when tightening chain Be careful that the cones do not turn when setting up nuts after tightening chain or adjusting crank axle. A safe plan is too take off chain, after it has been adjusted, to see if all bearings are right, then put on chain again without loosening axle.

[See adjusting chain.]

### Head or Steering Bearings.

The adjustment is a very important thing, some think a tight head will cause wheel to run steady, this is a mistake. It is better to have the head too loose than too tight, but have it just right, that is loose enough to turn easily, when held off the ground, with the little finger, but not loose enough to rattle or work up and down.

## THE PEDALS.

The pedals often become tight by the jam-nut getting loose, then working tight, the pedal cone tightening on balls. Keep jam nut tight.

Pedals need oil, as a rule they get very little.

### Cause of Chain Tightening.

Often when a chain is about right, upon riding after a rain or a heavy dew, mud and sand gets into the chain and sprockets, making a grinding or clicking sound, wipe off chain and sprockets and it will stop. Sometimes a chain will get a little tighter than usual and not be noticeable in riding only by the careful observer, often caused by rust from being in rain or left out in heavy dew, a drop of oil on each rivet will remedy it, wipe off oil from chain after turning the wheel about a minute.

### Oil the Chain.

The average chain has about 100 joints, and, in riding, these joints become dry and the chain stiff. In passing over the small sprocket wheel, these joints form elbows, and owing to the stiffness of the chain they do not entirely straighten out. Hence the chain appears to be tight. The remedy is in the oil can and not in the monkey wrench, graphite, stove polish, soap, etc. The chain needs a drop of oil at each side of every joint, then put on graphite if you have it; if not go ahead without it. It is the oil in the rivets that lubricates a chain, not the graphite that is on the chain.

### Climbing Chain.

One that rides up on the teeth of the sprockets, generally caused by worn sprockets, too soft metal, the links and rivets worn, poor chain or twisted links.

The best remedy is either new sprocket or sprockets, or new chain, often both.

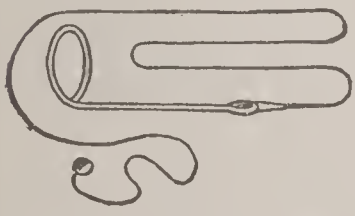
### Care of Bicycle Tires.

During wet weather tires are more liable to puncture than in dry weather. Even if not actually punctured, tires will often become depressed, and marks, nicks, etc., will appear in the gum.

### The Effect of Heat Upon Tires,

A rider who leaves his wheel for half a day in the sun cannot expect his tires to last as well as if they were in the shade. Hardly anything will take the life and elasticity out of a thin body of rubber like sunshine. Nor is it wise to drop oil on the tire. In case a part of the rubber crumbles away, leaving the fabric of the cover exposed, the threads should at once be covered with gutta percha or some other cement. If this is not done they will absorb water, which will follow them far inside of the cover and will eventually rot them off.

### Taking Out Inner Tubes,



Run the little ball around inside of casing, slip end of tube through loop in wire, and with the string pull the wire loop through casing and the tube is loose. Use loop made of No. 8 brass wire, soldered at the joint so there wont be any danger of cutting the tube.

### Blown Out at the End.

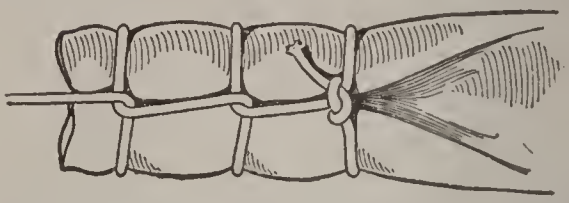
To repair an inner tube which has been blown out at the end. Cement the inside of the tube about 1½ inches, and then fold over the cemented end upon itself for half an inch.

### Mark Where the Air Escapes.

Mark the tire with an indelible pencil as soon as you find the puncture and while the tire is wet. When dry, the puncture that was easily found in the water tank becomes lost to view.

### Obstinate Inner Tube.

Here is a sketch of method of fastening a string to an inner tube for drawing tube back into tire. This form of tie gives a



strong hold, as it grips in three places. It holds the tube in pointed or wedge shape, instead of forming a lump at string end, which often tears the tube as well as making it extremely hard to pull it in position.

### Another Way.

Immerse that part of casing where the inner tube sticks, in warm water.

### Removing Refractory Tube.

Remove tire from wheel. Deflate. Grasp tires with both hands, lift it above head and bring it down to the floor—bang! Do this several times. The tube can usually be withdrawn. With ordinary care no damage will be done to tire, tube or valve.

### Inner Tube.

Sometimes the inner tube sticks so fast that it becomes impossible to get it out. By slitting the cover on the side opposite the valve, and on the inner surface where it lays on the rim, it can be easily removed and put back much easier. Then lace it up the same as you would the opening for the valve stem.

### Cementing Tire on Steel Rims.

The easiest and quickest way to recement a tire on a steel rim is to drop a little gasoline on old cement—just enough to run entirely around the rim. Then touch a match to it and let it burn out. Put tire on at once and pump up hard. This makes a good job, and it doesn't injure enamel like using a lamp.

### Removing Inner Tube.

When single tube tires become worn and leaky, inner tubes are often put in them. After they have been used for some time it becomes a very difficult matter to remove them. This may be done by filling the casing with gasoline; the tube will then pull out without effort. When gasoline has evaporated and you wish to replace tube, put a handful of powdered soapstone in case and turn tire around until soapstone becomes thoroughly distributed.

### Repairing Long Cuts.

Where the tire has a large cut, take a piece of old casing one size smaller. Trim off the rubber down to canvas about ½ inch back from each end for the purpose of protecting the inner tube from the sharp edges. Open up tire where cut is, slip the piece of casing in, thread the tube through and sew up.

### Valves in Order.

After unscrewing the cap, press down on the plunger. This will let part of air out, and the force of air coming out will blow out all loose dust and dirt that may be around valve. The cause of valve leaking is often by dirt adhering to same.

### CREEPING.

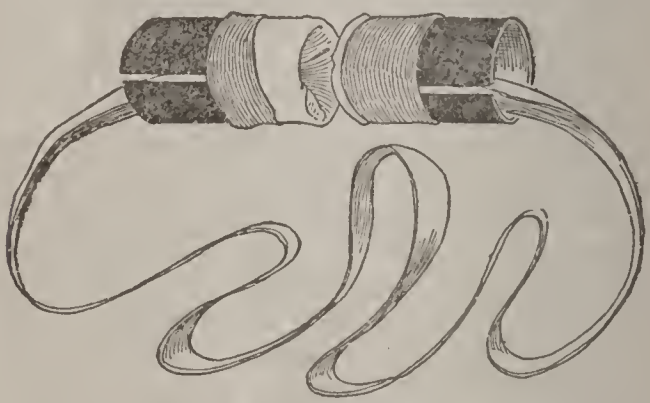
The smallest contact between air and the fabric of a tire means the escape of the air. Sometimes valves cause leakage of this kind. Sometimes it is the fault of the valve. More frequently it is the fault of the man who carelessly cements the tire to the rim, thus causing the tire to creep and the valve to become chafed. Often valve stem holes in wood are saw-edged. Often valves are handled very roughly.

### A LACER.

A common corset or shoe-string makes a splendid lace for tire. It is handy, cheap, strong and pliable; no needle is required.

## TELESCOPING A TUBE.

This plan as is in use in M.&W. repair shops for telescoping a tube. They use two short pieces of 1½-inch brass tubing, sawed open. They say: Pull one end through the brass tube, leaving just enough projecting at the other end as you wish the patch to be, i. e., one inch or more, and then turn it right over the brass tube. Then take the other end of rubber tube and pull it through the other brass tube, only have the end project twice as long as the first one, i. e., about two inches or more and turn it over the brass tube same as the first end. Then turn this long end back on itself. It is now ready for the cement. Put



plenty of cement on both ends so made, and when tacky, place brass tubes, with the two ends on, together, and lap one over the other and keep there until dry. Then pull off, and the entire tube is easily gotten from the brass tube by reason of the brass tube being slotted. By making one turn of the rubber over one brass tube and two turns over the other one you can readily see that on the first brass tube the inside of tube is exposed, whereas on the second brass tube, which has two turns of rubber, the outside of tube is exposed. The great advantage of this plan is that it can be used either for splicing or telescoping inner tubes.

### How to Repair Valve Stem Leaks.

When valve stems are cut by friction on edge of rim or otherwise, deflate tire, cover valve stem with liquid cement, being sure to fill cut thoroughly, cover stem and cut with small rubber bands. Be sure and pass bands two or three times around, so that they will squeeze into cut. Bands to cover stem at least one-fourth inch each side of cut all the way around.

### Careless Repairmen.

Many riders and repairmen are careless in putting tubes in covers after patching, without using soapstone or chalk. The result is that when next the inner tube needs fixing, it cannot be removed. Use soapstone freely around patches; even fine road dust is better than nothing.

### PUNCTURES.

In sections of the country where thorns and cactus points cause trouble, instead of extracting the thorn it is better to snap it off flush with the tire. In this way the air will be retained and the tire will be more likely to carry the rider home safely.

Occasionally the lap— that place in the outer casing where the ends of the canvas fabric are joined— works loose, generally because the tire is allowed to remain flabby while being used.

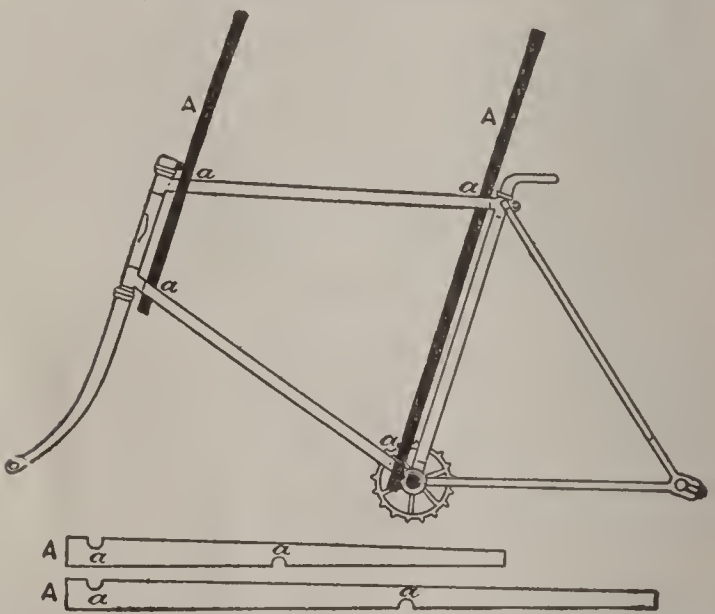
### Putting Away for the Winter.

When the bicycle is put away for winter, it should be thoroughly cleaned and vaseline or gun grease rubbed over all the bright parts, and the bearings should be flushed with oil. The tires should also be thoroughly cleaned, and the machine inverted so as to rest on the handle bar and saddle, so that the weight will not rest on the tire. A bicycle stand is still better, or the wheel may be suspended from the ceiling.

### To Straighten a Twisted Frame.

Two soft pine boards, five feet long, about one inch thick, four or five inches wide at the butt end, and two inches at the small end are represented by A A; they are cut or notched out at a, a, a, a, to receive the tubing of the frame. This is to prevent the collapsing of the tubes.

To operate, place one end of the board inside of the frame, the other end outside of the frame, as near the steering head as




possible. Place the other board the reverse to this as near the sprocket and saddle post as possible. Pull the frame straight, which can be observed by sighting through, and noting that the steering head is parallel with the seat post.

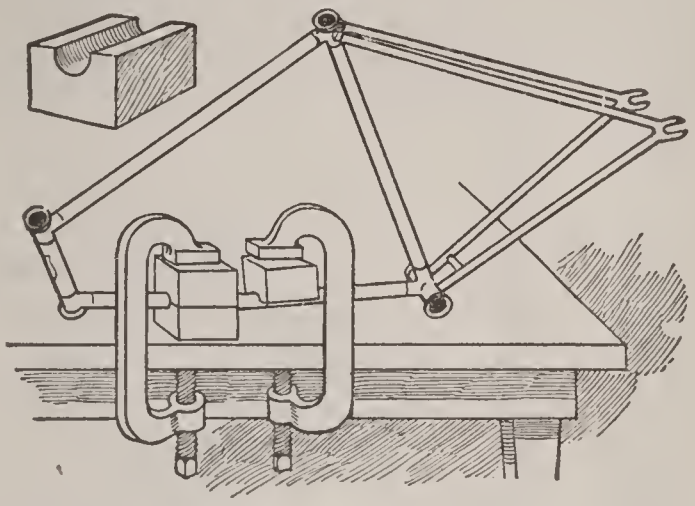
Frames may be straightened this way without damage to frame or finish, and with very little expense.

### To Remove a Sprocket.

To remove a screwed-on sprocket or any other screw, turpentine is a never failing laxative. The parts should be warmed when possible.

### To Straighten Short Bend in Frame,

The accompanying cut will show you how to straighten short bends in frames, or can be used for any kind of bend.



Three blocks—one three inches and two 2 inches square. Cut groove to fit tubing. Two common clamps; lay on table as in figure. Clamp frame near bend between two blocks; draw down with second clamp until frame is straight. Use poplar or pine blocks.

### Truing Front Forks.

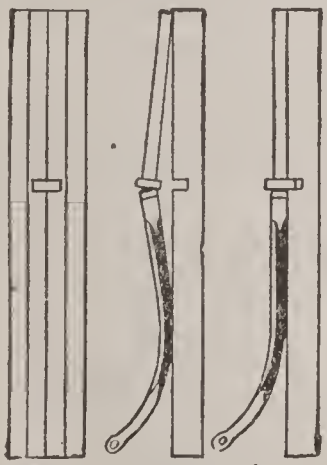


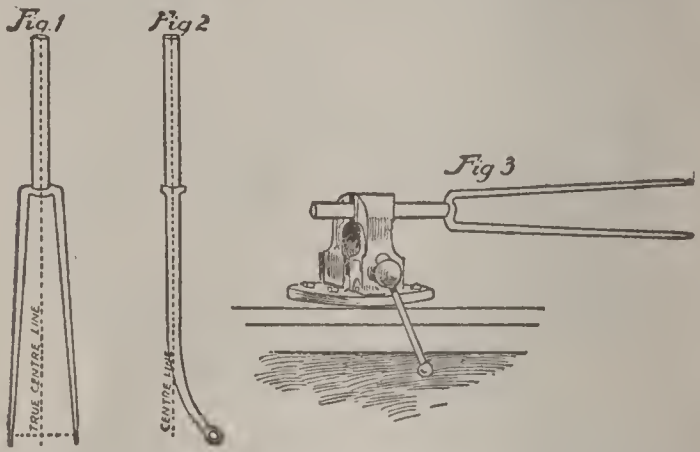
Fig. 1 Fig. 2 Fig. 3

A simple method for truing front forks when bent backward, using a piece of 1-inch straight board 6 inches wide and 3 feet long. Fig. 1 shows face of board with mortise for extended parts. By lining off as shown in diagram, it is very handy for truing when bent sideways.

The Rev. Dr. Harrison, of Brooklyn, pronounces cycling the cleanest possible sport which brings a man nearer to heaven.

### Another Way of Truing Front Forks.

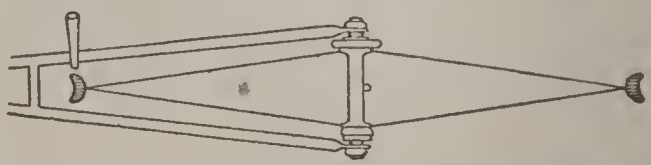
First prove with square and see if crown and stem are at right angles; if not, place the stem over a stout bar firmly secured in a bench vise. Using forks as lever, bend stem until true with crown. Place stem in vise as in Fig. 3, and pull forks into line as shown




in Fig.2. Then move forks one fourth turn in vise and pull or shove fork sides into line as shown in Fig. 1, keeping points A and B equi-distant from true centre line. Care should be taken to have the curve indicated by C, the same on each fork side. Good practice is required for this job, as it is important that the fork should be true.

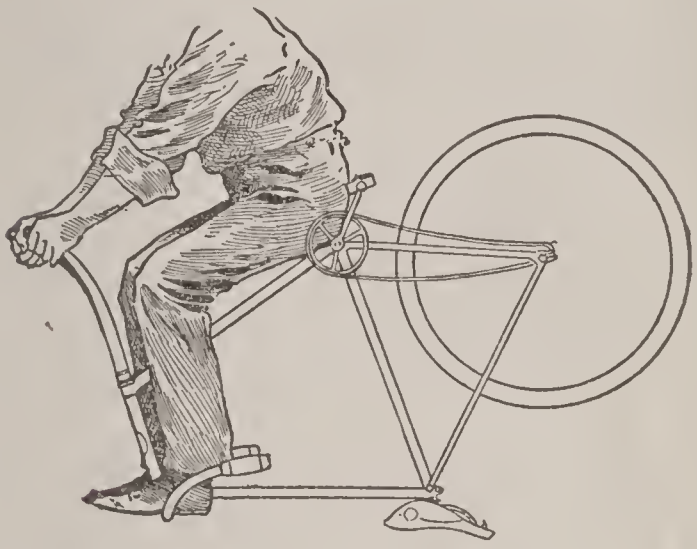
### Truing Up a Wheel.

A very simple method of truing a wheel. Rest the bottom bracket on something to to keep it clear of the floor. Hold a chalk crayon near the rim letting it rest on the lower base. Revolve wheel and set up the



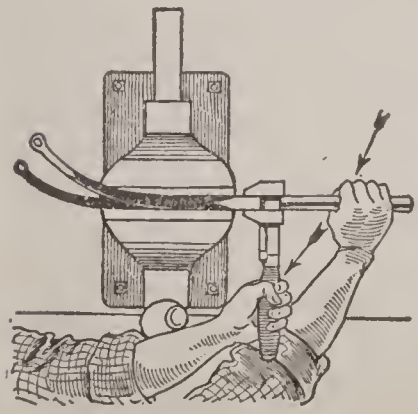
spokes where the chalk marks the rim. Rub off the chalk marks and continue as above until the chalk takes on all parts of the rim.

If fork is bent only in the sides, it is not always necessary to take out of wheel. Turn wheel upside down. Take out front wheel after noting how fork is bent; straddle wheel and sit on sprocket wheel; put feet on bars, grasp forks in both hands and push one at a time forward till it lines up with head,



follow with other one [Fig. 1]. If very badly bent in either crown or sides, it is better to heat it. If the crown is bent I usually catch hold of top of fork at point where the crown projects into fork side, and pull with wrench and push the fork side.

If badly bent or very stiff, take out of head, clamp lightly one side of fork in vise, bushing the jaws with a piece of cloth [Fig. 2]. Thrust a long steel rod down the stem and put the wrench on as before, laying a piece of leather or cloth over the fork to prevent scratching. In

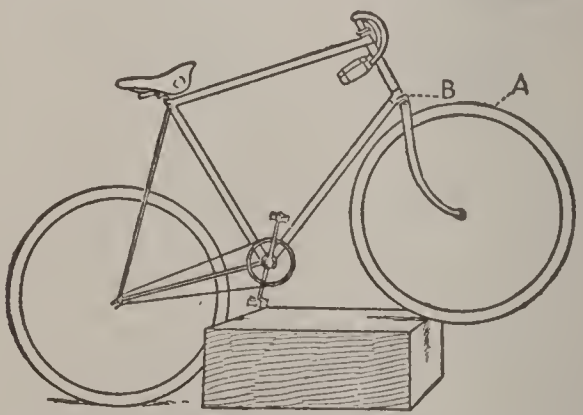


this way you can bend any fork. If it needs heating, as many do, heat and follow same plan. If stem is bent, heat it; pull back by putting forks into vise and heat place to be bent only. Thrust in steel rod and pull back to place.

To true up sideways, put in wheel again. Get a long straight-edge or straight bar and lay it along center of head. If it stands midway between forks, and head is true with frame, the wheels should track. A person can test this by riding hands off or by his eye.

### To Straighten Front Fork Crown,

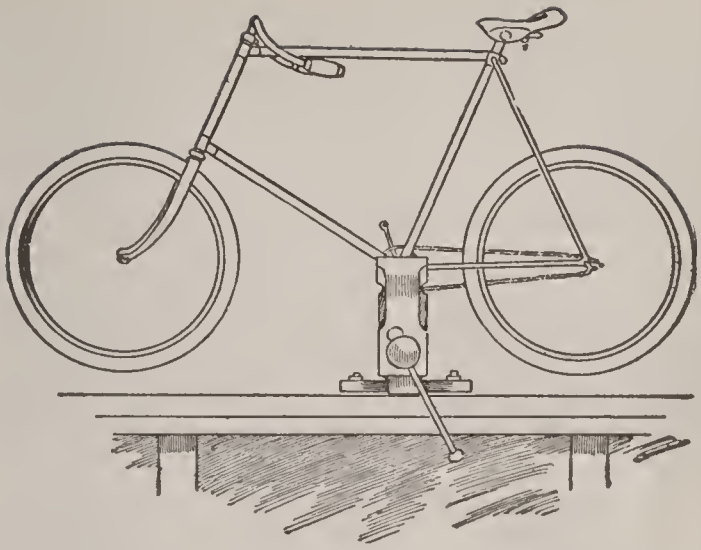
A quick and simple way to straighten the front fork crown of a bicycle is to place it on a box, as shown below. B shows the bend. An assistant should hold the rear wheel down on the floor. The workman takes hold of the front wheel at A, and by pulling forward




easily brings the forks into their original position. If one fork is bent back farther than the other, the front wheel should be turned toward that side a little, in order to put more pressure on that side. The tires should be pumped hard so the edges of the box will not injure the rims.

### To Line Up a Sprocket.

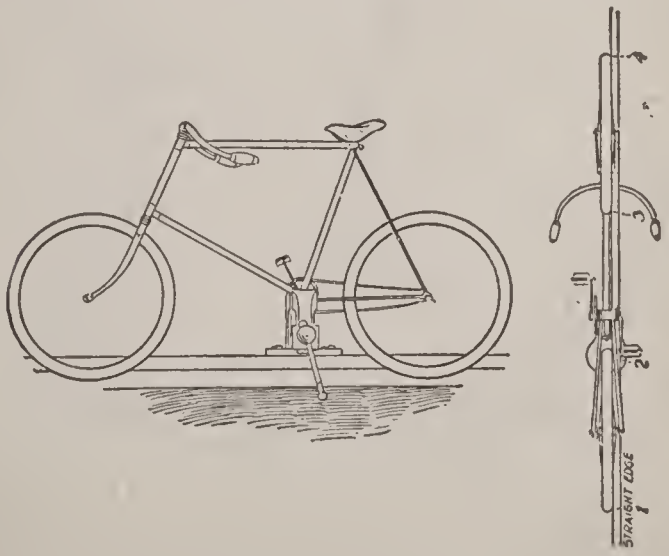
Grip ends of crank shaft firmly in bench vise, as in illustration; use three-foot straight-edge on the outside of large sprocket wheel,



and if the rear one is out or in, throw into line by pulling or shoving on rear forks until they are in perfect alignment.

**When Both Bars are Thrown Over.**

To line up the wheels when caused by both top and bottom bars being thrown over. Put the whole wheel in bench vise by gripping ends of crank shaft very firmly. First line up the sprockets; then, placing one hand on the fork near front axle, and the

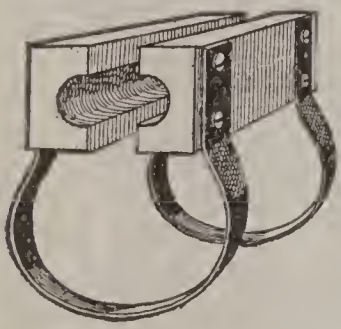



other on the head, pull or shove front wheel

into line with the rear one. To prove when true to line, use straight-edge six or seven feet long on side of wheels, as shown in illustration. Points indicated by the figures 1, 2, 3, 4, should all touch straight-edge at the same time.

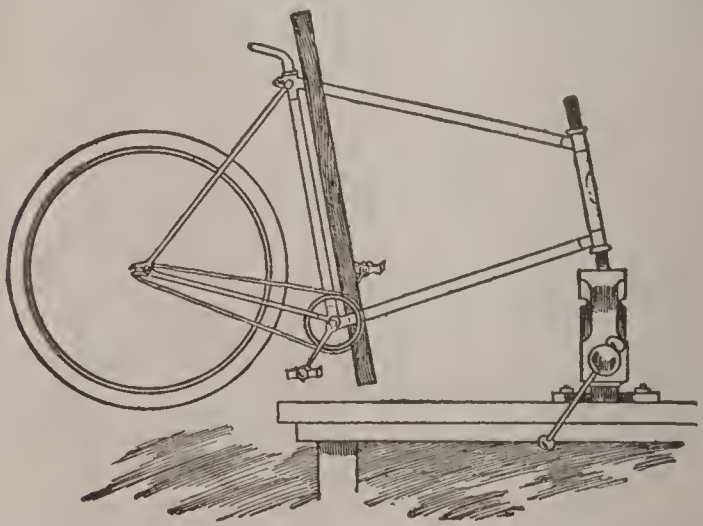
**Blocks for Straightening Tubing.**

Take two blocks of the size desired for the purpose, place the faces together and clamp in vise. Use a bit the size of tubing to be worked upon, place point of bit in center of joint between the two blocks and bore a hole through the blocks.



**To Line Up a Wheel.**

To line up the wheels when caused by a twist in the frame, first remove forks from frame and secure a steel bar of the proper diameter, about 15 inches in length. Grip the bar perpendicularly in the bench vise and slide steering head shield over bar.

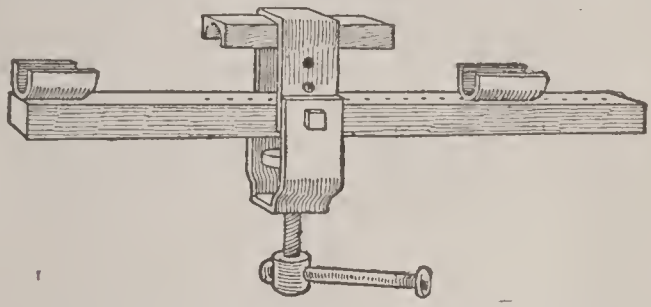


Procure a stout hard wood stick, 1½x2 inches and four feet long, and place it upright through frame, near the pillar post. Take a

firm hold of the stick near each end and twist in the way desired, until the steering head shield is in line with the pillar post. See illustration.

### Tube Straightener.

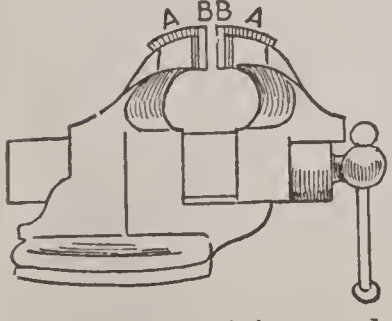
It is very cheap, and any repairman can make it for himself. The clamp in sketch can be reversed and half-round block put on end of screw instead of as per sketch, making it very easy to straighten short inbends in rear fork, etc. The long wood block [1¼ inch square and 18 inches long] is slightly curved



from end to end to give tubing a chance to spring back. I use blocks in clamp made of soft wood, just the size of tube and three inches long. On the long block I use ¼x3 inch flat iron, bent to fit 1¼ inch tubing. I fill in with leather to fit tube. One end is stationary and the other is movable. Use two wood screws to hold in place.

### Taking Bends Out of Handle Bars.

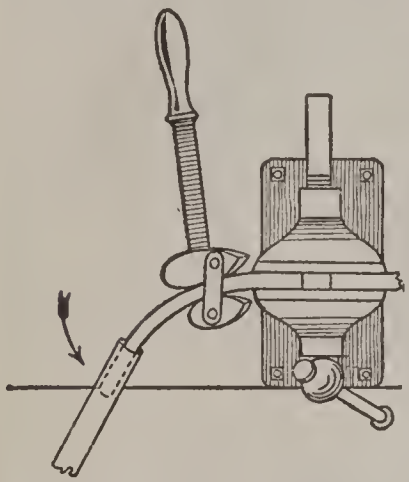
Method to take kinks or bends out of tubing or handle bars. Two pieces of brass (AA) formed to vise jaws; two pieces of new hard leather belting [BB]; rivet to brass. Take short grips on kinks. After kinks are out as much as possible, revolve the tubing or handle bar in the leather grips, which will give a polished finish. The



leather must be at least ⅜ inch thick, which will form a circle around the tubing.

### Bending Handle Bars.

Remove grips, fill bar with sand and pound same down hard. Plug both ends with metal plugs; tapered are best. Wash bar thoroughly clean and wipe nickel dry. Heat under a



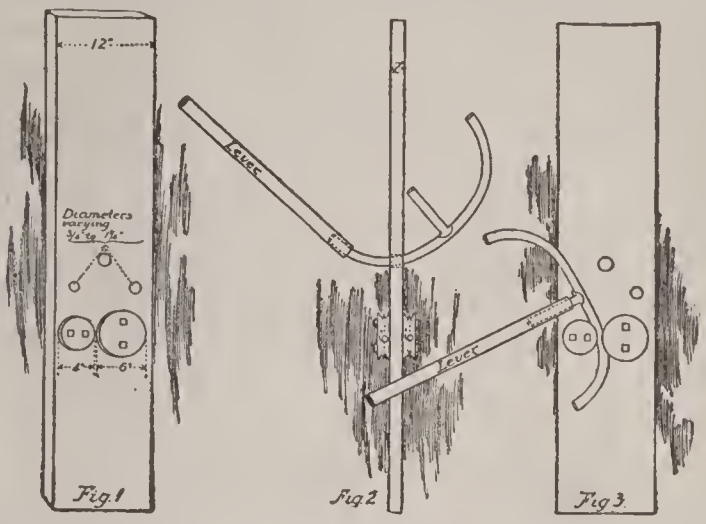
gas or gasoline flame until it reaches a bright cherry red. Have your vise fitted with sheet brass jaws, and clamp bar into a position where it will not turn. Slip a piece of tubing over end of bar for a lever and bend. Repeat this process until one side is properly bent, then bend opposite side to match.

A handy tool for bending bars is made of two brass castings, grooved to fit bars on inside edge. A lever is fitted to one, and the two are connected by strong bars of iron. It works on the plan of an eccentric. Two of these wrenches make the job easier. Buff bars on polishing wheel with rotten stone and oil. After cleaning bars, finish with another buff, using Vienna lime prepared in stick form for this purpose, or rouge. Bars will now look like new.

### To Bend Handle Bar.

To bend handle bars, remove grips and fill bar with melted resin or lead, [I prefer lead] taking care to have bar quite warm while filling. Prepare the bending form as follows: procure a hardwood plank 2 inches thick, 12 inches wide and long enough to reach from floor to ceiling. Fasten firmly at both ends. Then bore a one inch hole through plank about 30 inches from the floor. This hole

will be found very handy in making short bends by placing the bar through the hole

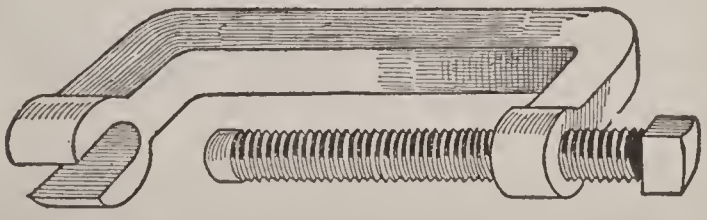



and using a piece of tubing 18 inches long and large enough to go over the end of the bar. This will give a sufficient leverage to bend the stiffest bar. Next take four pulleys 2 inches in diameter, two 4 inches in diameter, and two 6 inches in diameter. Bolt the pulleys firmly to the plank, two on each side, 2 feet from the floor, the small pulleys being opposite each other and the larger one likewise, as shown in figs. 1 and 2. This makes a good form for making the long bends and changing the drop.

**Crank Pins.**

In driving out a sticky crank pin, support the crank on an anvil; oil the key, then use heavy hammer and short, stiff piece of brass held on key. Many keys are spoiled by using too light a hammer, upsetting end of key.

**Crank Key Remover.**



It overcomes the battering of threads and

the danger of breaking cones, so often done with hammer or mallet. It can be used to force a key in as well as out. It is made of best tool steel. The end of screw is bored out and small brass plug put in and left cup-shaped to prevent its slipping off.

### Removing Crank Keys.

Take a brass or copper block 1½ in, in diameter, drill a half inch hole through it [C]; bend a piece of sheet brass to fit jaw of vise [D]; place small o r threaded end against

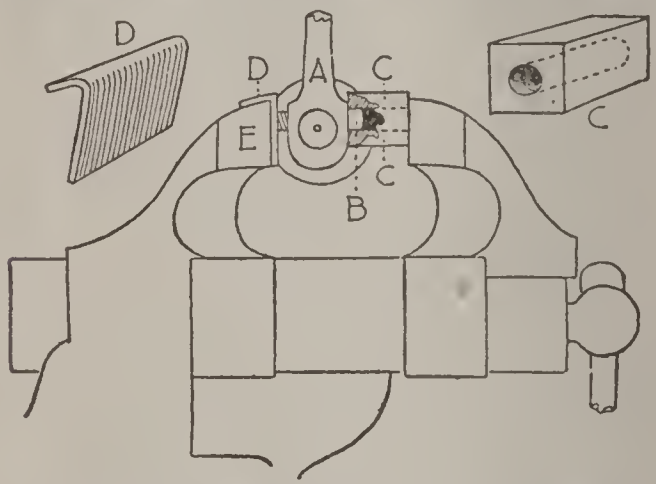



plate D, and the block C over opposite side of sleeve of crank. Tighten vise quickly, and the pin will come out without injury to any part of machine. To replace pin, reverse the operation, tightening vise quickly.

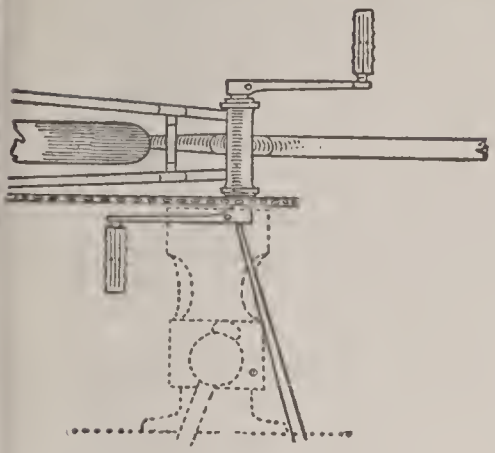
A pipe cutter is far better than a file for cutting handle bars.

### Putting Bearings Together.

In putting bearings together, where it is difficult to keep balls in cups until secured by cover, daub vaseline iu the ball cup and drop in the balls; the vaseline will hold them in place.

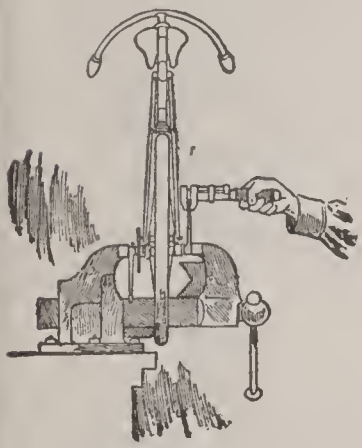
It is not how much you ride, but how well you ride. Get all the pleasure you can out of your wheel and avoid that "tired feeling"

### Removing Tight Fitting Cranks.



Take a firm grip on the crank with the vise, and drive out axle with a long center punch Use clamps of copper in vise.

### Straightening Cranks.



All ordinary cranks can be straightened while on the shaft by gripping the crank shaft firmly endwise in the bench vise; now remove pedals and use a large monkey wrench as a bender on the small end of cranks.

### DRILLING WOOD RIMS.

First, space off the new rim and mark as shown in Fig. 1. Have a stick, as shown in Fig. 2, made of $1\frac{1}{2}$x$\frac{7}{8}$ stuff, the cross pieces

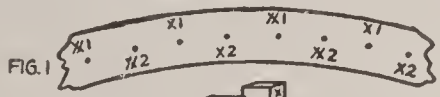



FIG. 1

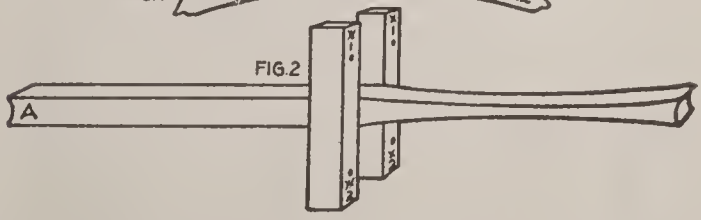
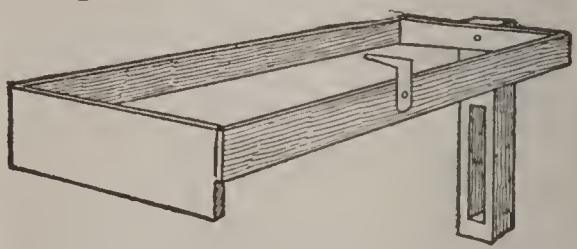



FIG. 2

each 6 inches long, marked as shown. H1 and H2 on the cross piece are the length of the hub apart, and also X1 and X2, from H2

to X2 is the diameter of flange. Put the stick into a rim exactly across the center, the figures on cross pieces on same side as figures on rim, beginning at say H2 at end A of stick. Put a drill of proper size in lathe, set tail-stick with center at the mark on cross piece, corresponding to the one on the rim. Drill that hole; slip the stick around to next mark, and drill in the same manner; countersinking for washers. After starting to drill, the stick should not be turned over.

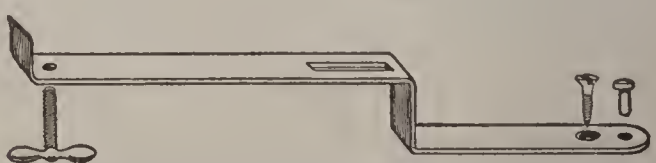
The frame shown in sketch is fastened on the lathe bed by the back piece, which is slotted for adjustment for different spread of wheels. The front end of frame is made of such height as will be right for the swing of lathe and bring the center of rim up to the drill. Use a twist drill for boring the hole. The spacing is marked both on inside and



outside of rim, so the operator can see when his brill points to the center. A pointer at the back end of frame is used and the rim turned to bring the spacing and pointer together. Drill every other hole and then turn the rim over and finish. A countersink for the washer may be attached to drill and both operations be completed at once.

### TRUING UP A WHEEL.

This device is made of $1\frac{1}{2}$x$\frac{1}{2}$ inch iron; the



lower part is 8 inches, the rising part 3 inches. and the upper part 17 inches long. Fasten

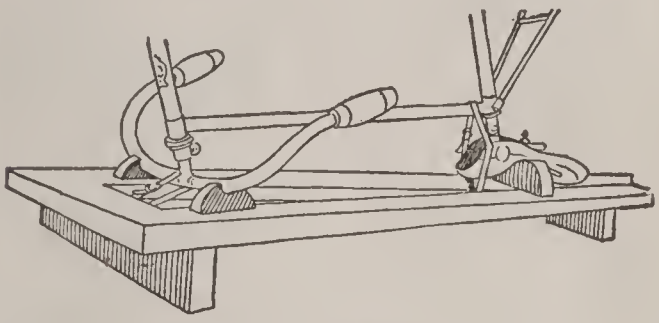
to edge of bench with heavy screw. Put pin in end to hold up when in use.

### Cause of Rims Clicking.

What causes a good many wood rim bicycles to "crack" as if there was a ball broken. It is on account of loose spokes. Grasp tire with both hands and pull as hard as possible on wheel, at same time turn wheel around; the trouble will display itself.

### Repair Stand.

Fasten the bicycle to the stand with straps.



The stand is 20 inches wide at the end, and the sides are 3 feet long running a point.

### The Best Wheelman.

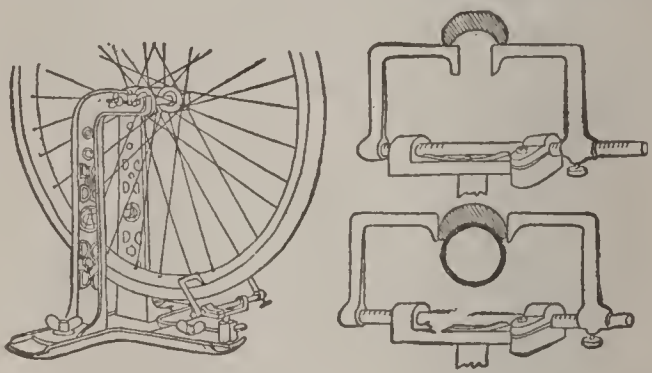
It would be well to remember that the best wheelman is he who is most mindful of the rights of others and not he who is most reckless in the enjoyment of himself. Everybody, on or off the wheel, should be considerate of the convenience, comfort and safety of everyone else. That is a good way to get along smoothly in this rough and tumble, work-a-day world.

### On Road and Path.

A man may be a good and capable cyclist and yet be unable to negotiate a modern cycle track to advantage. A man may be a first-class racer and yet be unable to thread his way in a crowded city's streets. Each in his own way is an expert.

### Wheel Balancer and Repair Stand.

The A. Dudley Mfg. Co., Menominee, Mich., are makers of one the best wheel balancers and repair stands known. It is questionable whether anything has yet been produced equal to it in value. The sketches show the device in operation and also the attachments for gauging periphery of rim and gauging side lines of rim. It bears so many points of excellence that almost any person of ordinary intelligence can repair and true



up a bicycle wheel. It is portable and does not need to be fastened down. It will balance any wheel from 24 to 30 inches in diameter and can be set for any width of a wheel-hub. The extension jaws of the hangers are supplied with springs and thumb-nuts, so the wheel-axle of any thickness will be held firmly in place. The balancing gauge is adjustable in every direction and will gauge the wheel rim on its circumference and side lines; it is made of brass and steel, nicely finished and nickel plated. See adv.

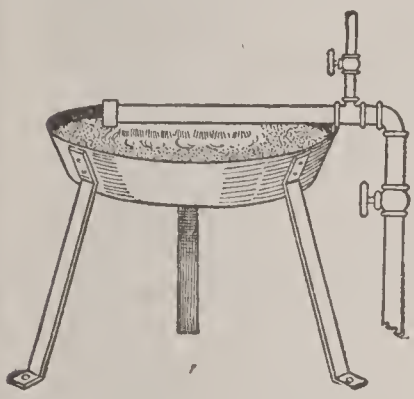
### Trough for Testing Tubes.

A useful article in the repair shop is a water trough for testing tubes, valves, etc. Take two boards 9 inches wide and 16 inches long for a stand, on them nail a flaring trough 24 inches long, 16 inches across top, 10 inches across bottom; end piece, 6 inches wide 16 inches long at top and 9 inches at bottom. To make it water tight, pour a little tire ce-

ment in joints. In one end or centre put ⅜-inch gas pipe with valve to run through floor.

### A GOOD GAS FORGE.

A forge for small work can be made at small expense. This is one we have in use. Get a sheet iron pan 18 inches in diameter and 4 or 5 inches deep; have three or four wrought iron legs bolted or riveted on and screwed to floor near a gas connection. The length of the different pipes will depend on circumstances. A fan blower is best, and should be as near forge as possible. Use large pipe for air. If a foot blower is used, rubber tubing can be attached and no valve is necessary for air. The tube projecting over pan should be ¾-inch gas pipe, and a row of 3-16-inch holes drilled close together on the under side. Two tubes may be used for the flame, setting them side by side. These will turn the blaze slightly inward toward each other. This forge throws a clear blue flame, and is particularly adapted for bending handle bars, straightening fork stems, seat posts, etc., as the flame does not burn the nickel,



A-Gas Inlet. B-Air Inlet.

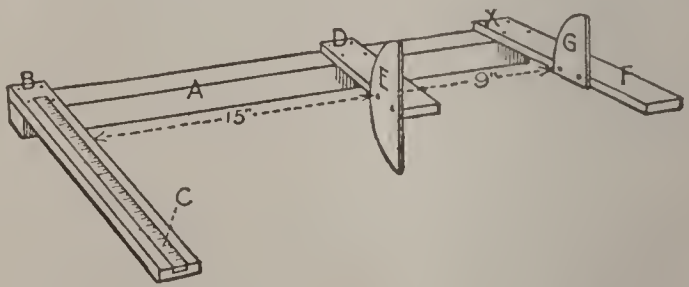
### Removing Tight Cranks and Other Parts.

We all know that heat causes a piece of metal to expand, and therefore when one piece fits so tightly into another that it cannot be removed we heat the outer piece to make it larger and endeavor to avoid heating the inner piece lest perchance that should expand, too. But the point that it seems important to insist upon is, that in these cases only a very slight degree of heat, in fact, not a great deal more than can be borne with the fingers is needed, and all beyond that is ob-

jectionable. What we want is to alter the relative heat of the two pieces, and as they are so closed together it is generally impossible to get the temperature of the one more than a comparatively small amount higher than the temperature of the other. If we go on applying heat they are both sure to rise. To follow the directions which have sometimes appeared in print, and raise the outer piece to cherry red, would be a certain way of injuring the adjacent cups probably the plating, while little if anything, would be gained as compared with applying only a slight degree of warmth.

### Guage to Try Front Forks.

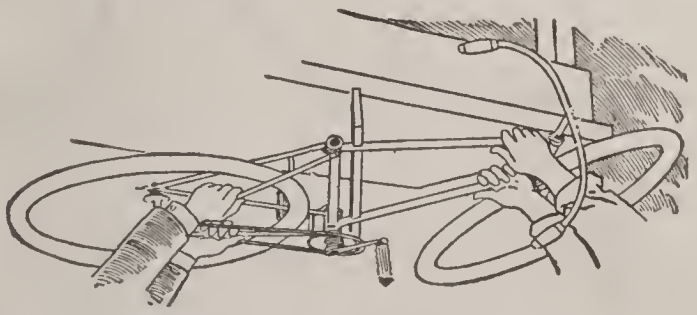
The material is as follows: A, hard wood 1½ x1½ x 29 inches; B, hard wood ¾ x 3 x 10 inches; D, hard wood ¾ x 2 x 6 inches; F, hard wood ¾ x 2 8 inches; E, is a piece of iron about 3 inches long screwed on the edge at the end of D; G, is also a piece of iron about 3 inches long screwed on the edge of F 6 inches from X; C, is a brass slide set into B, and is divided into equal divisions from the center each way.




To try the fork to see if it is true, place the neck on the instrument against E and G, with the ends of the fork over the slide C, and move slide until both forks show on slide alike; then turn fork over, and if both are still alike, all is right; if not move the slide one-half the difference and the center of slide will be in line with center of neck, then bend until both forks show on slide alike.

## STRAIGHTENING FRAMES.

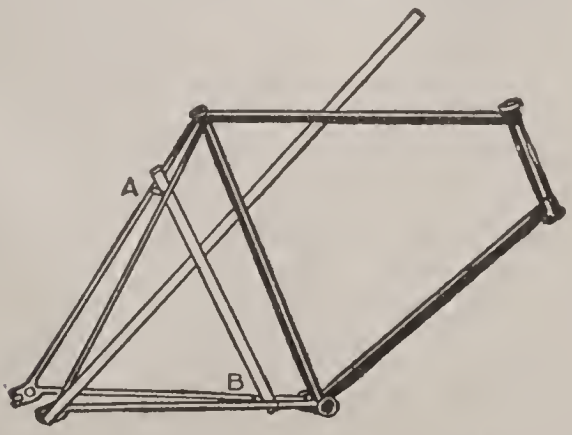
Method of straightening frames that are bent sideways without removing wheels or front forks. In some cases it may be necessary to remove sprocket shaft and wheel. First line up sprocket wheels and bolt rear wheel fast to rear forks; lay the frame across a soft stick of wood notched or cut away to receive the frame at proper places as near



the crank shaft or hanger and seat lug as possible, and bend, as shown, until the wheels are in line. This is a quick method of straightening frames that are bent sideways, as the wheels do not have to be removed, and if they are removed, they have to be replaced to line them up, which consumes considerable time and means extra expense.

### Truing Rear Forks.

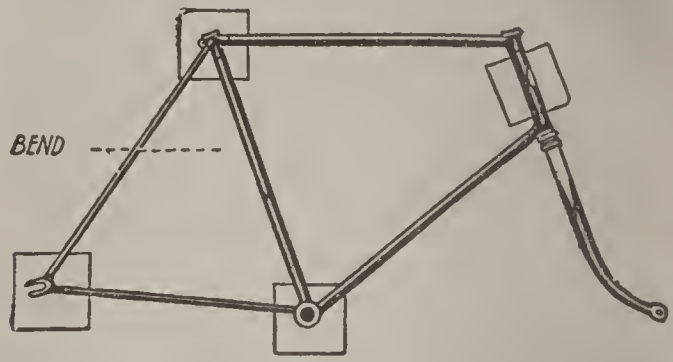
To true rear forks, put lever in wheel seat, then pry over a stick placed just in front of




the braces, A and B. By making fulcrum at this point, it will prevent breaking of joints.

### Another Way to Straighten Bent Frames.

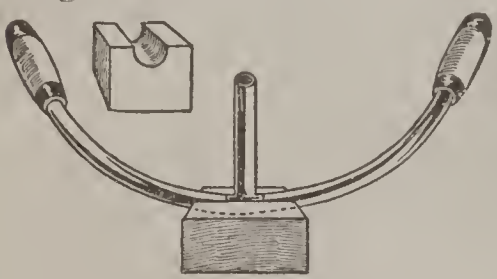
Lay frame on blocks as per sketch; take a stick of medium length, say a broomstick: let a person stand on one end and roll the stick




gently back and forth until the frame is straightened. If the tube flattens, turn up the other way and roll until in proper shape. This plan will give you good results.

### STRAIGHTENING HANDLE BARS.

Take a bar of iron or steel [the latter polished and hardened a little is best] which exactly fits inside of tube and about 12 inches long. Procure a block of wood about 2 inches square and four in length, and cut out a notch on one side to fit upper side of handle bar at joining of upright tube to prevent jamming. Place the block on an anvil with notch up, then place handle bar on block and drive the solid bar inside the tube. In this way the tube is left as smooth and true as ever. The bar can readily be removed from tube by twisting back and forth a few times in a vise. If the tube has been badly kinked, it is a good plan, after straightening, to drive a short piece of tubing inside, for without it the tube will bend more easily a second time. A hollow seat post can also be treated in the same manner."



### Formulæ For Repairmen.

Some valuable formulæ have been furnished by Mr. G. A. Suverkrop, mechanical engineer, Camden, N. J. He says: "They are all practicable and practical. I have used them and know them to be good." On the subject of brazing, he says: "So many of us use whatever spelter we can buy, without knowing whether it will be suitable for the job in hand."

### Spelter for Bicycle Brazing.

The best spelter for bicycle work is that used by scientific instrument makers and generally called silver solder, owing to the admixture of silver in it, and when one takes into consideration the small amount required to make a joint, it is not much more expensive than brass, and where light racing frames are to be built or fixed, it is almost a necessity. Owing to its low melting point, the joint is made before the tube is heated enough to "scale" and consequently decrease thickness still further. Anyone with a small forge and 20-cent crucible can make spelter. The formula for silver solder is as follows: Fine silver 19 dwts.; copper, 1dwt.; brass wire, 2 dwts. Melt in crucible under a coat of powdered charcoal; when melted, pour into a bucket of clean water to granulate, or pour into a wood-en mold and hammer into a thin sheet.

Another spelter, cheaper and nearly as free running as silver solder: Copper 1 oz.; zinc, 1 oz. Melt copper first, add zinc, pour quickly into water.

Stronger spelter is in the proportion of copper, 32; zinc, 29; tin, 1.

The work to be brazed should be clean at joints, free from all grease and rust.

### Better Than Borax as a Flux.

Borax may be used as a flux, but as borax on cooling becomes very hard and is conducive to bad language and spoiled files, a better flux is: Borax, in powder, 1 lb.; bicarbonate of

soda, powdered, 1 lb. Use same as common borax, and when braze is finished and job is still red hot, dip in soapy water [steel will not harden in soapy water], and scale will fall off and leave steel and brass clean. Any little scale that does remain can almost be scraped off with the finger nail.

### A Birmingham Method of Brazing.

There is a method of brazing hardly known outside of Birmingham, Eng., by means of which I have done some very difficult jobs. This is brazing without heat. There are several formulæ. but I give the best that has come under my notice, and is suitable for steel and iron. Take ¼ oz flouric acid [hydroflouric acid] brass filings, 2 oz.; steel filings, 1 oz. Put the brass and steel into the flouric acid; touch each part of the work to be brazed with the mixture and put them together; allow them to set. Dont forget to put the mixture in an earthen vessel, as flouric acid will dissolve glass.

### SOFT SOLDERING WITHOUT HEAT.

While writing of brazing without heat, perhaps a method of soft soldering without heat would be in line. Take ammonia, 1 oz.; common salt, 1 oz.; calcinede tartar, 1 oz.; antimony 3 ozs · Pound well together and sift. Put this in a piece of linen and inclose it well round with Fuller's earth about an inch thick . Let it dry, then put it in a crucible covered by another crucible, over a slow fire to get hot by degrees.; keep up the fire until the contents of the crucible get hot und melt, then let it cool gradually, and pound the mixture to a fine powder.

Here is a way to braze bicycle frames that works as well as a blow pipe. Make a funnel of asbestos about 12 in. high, 7 in. in diameter at small end. Place it over the forge fire, large end down. The more air you blow into the fire the larger the flame will be at top of funnel.

### How To Straighten Crushed Frames.

If tubes have been dented or crushed in such a manner that it is impossible to make them look good without inserting new ones, take the small rivets out at the joints, unbraze the joint, and take tube entirely off frame. Drive a mandrel the right size down through tube and it will bring it out as nice as a new tube. If the tubing is not cracked or broken and it has a small check lengthwise it can be remedied by melting a little brass on tube before brazing in place. Of course, I only do this when it is impossible to get new tubing on short notice. With care, a small bicycle shop can do as nice job as the factory.

### To Clean Tubes For Brazing.

To clean tubes for brazing, heat tube nearly red in a clear blaze. Allow it to cool; rub bright with clean emery paper. Rub with borax paste and it is ready to braze.

### Another Way.

The best way to prepare tubing for brazing is to clean off the ends thoroughly with emery cloth, clean inside with cotton waste, and with emery take off the frays from ends.

### To Braze Loose Fitting Joints.

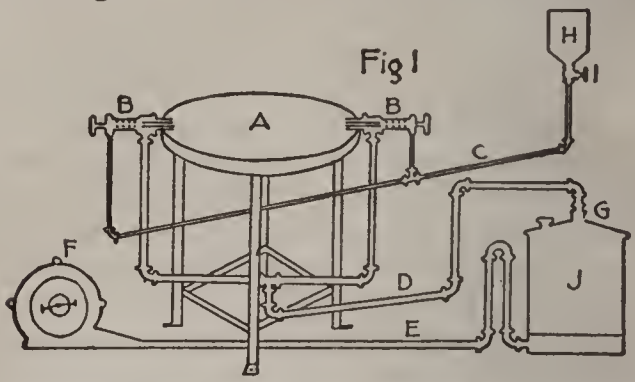
To braze open or loose fitting joints when not convenient to charge with spelter and borax, use 3-16 high brass rod, about 2 feet in length, by heating end of rod and applying borax in the usual way. When joint is at about the proper heat allow end of rod to remain on the joint until sufficient brass is melted and the joint is well filled. This is simple and is superior to the best spelter.

### To Prevent Rust.

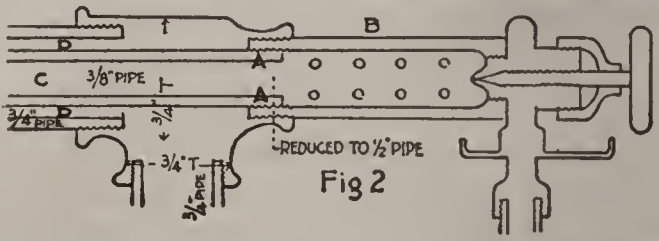
To prevent rust after soft-soldering nickel-plated or plain steel spokes, apply common baking soda dissolved in rain water.

### Gasoline Brazing Furnace.

It charges the blast with a vapor that burn as good as gas. It is necessary for the blast t



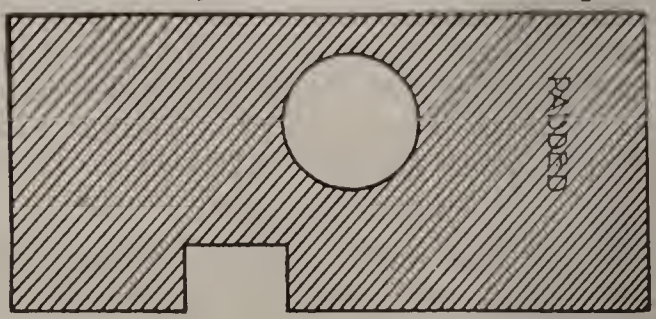

enter tank (G) as near the bottom as possibl while it has its outlet at the top. A five ga lon oil can is best to use. When the gas leave the tank (G) and is forced through pipe (I




and burner (B), it is lighted and makes a hc blast. At A it is necessary to have a tigh joint, so blast will not get into burner; at C flame comes out from burner (B); at D th blast or gas comes out and is lighted by flam (C).

### Padded Table For Repairmen.

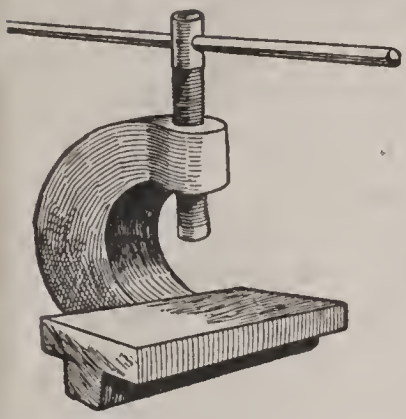
Sketch of a padded table for repairmei




The illustration is self-explanatory.

### Useful Press.

The cut of small press is self-explanatory to repairmen. It is useful for straightening bent forks—by using suitable blocks of wood—bent cranks, etc. The tool is screwed into the vise for use, or may be attached to the bench. The base is 10 inches long, 4 inches wide and 4 inches between base and end of screw at its highest point. The press weighs about thirty pounds.



### A Brazing Furnace.

George S. Perkins, Great Falls, Mont., writes:

"I send you a sketch of a brazing furnace I have just made which works to perfection with either kerosene, gasoline or benzine. I have tried them all. For gasoline, use 15 pounds pressure, and kerosene, 20 to 25 pounds. Any floor pump will give the necessary pressure. My furnace cost me just $10.00. besides my work. Following are the materials, with cost of same here.

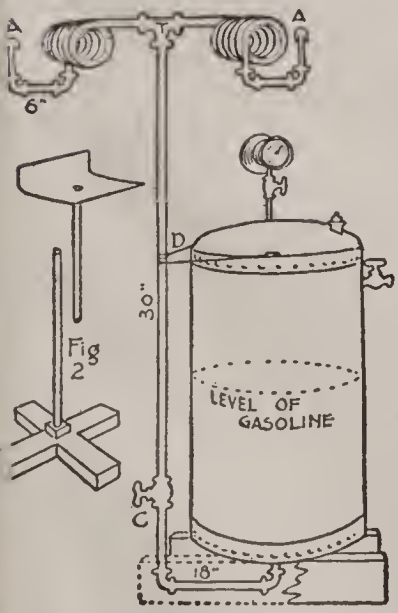


Fig 2

gallon can of 18 guage iron $6.50, 3 pieces -in. pipe, 50 in. long, threaded, 3 pieces ⅛-in. ipe, 2 in. long, threaded, 1 piece ⅛-in pipe, in. long, threaded, 1 piece ⅛-in. pipe, 18 in. ng, threaded, 2 pieces ⅛-in pipe, 6 in. long,

threaded,6 elbows, 1 T, 1 reducer, 1 to ¾x1¾ in. plug, 2 caps, 1 globe valve, 1 cock, 1 steam guage, $3.50. Total $10.00.

"Screw a cap on two of the 30-in pieces and run it full of lead, and make generating coils by winding on a 1½-inch mandrel. Connect as shown in cut. Generate with about two teaspoonfuls of gasoline in a litte cup hung to the rod underneath coils. Have jets focus about 7 inches from coils. The vents in mine are 3-64 in. The stand is made of two pieces of 2x4 joist, an iron rod and a piece of 16 guage iron 8x12, having 4 inches turned up, as shown in Fig. 2. It takes just 30 inches to make the coils, which should be about 8 inches apart. I have no parts to sell, but will give anyone further pointers gratis if they will send stamp for reply."

## BRAZING

In order to thoroughly understand the art of brazing, it is necessary to fully comprehend the principles involved, and to know just exactly what is accomplished by a skilled brazier when he unites two or more pieces of steel or other metal. The workman should learn how to accomplish certain results and why these results are accomplished.

The requisite appliances for brazing are few. One must have a forge of some kind, some spelter, some borax and a few files—the fewer the better. The furnace may be the old blacksmith's forge or a modern brazing furnace. The better the furnace the better the result, but a careful workman will do better work with an old forge than a careless workman will do with the best possible surroundings. The heat must be clear, smokeless and regular. Brazing furnaces are not difficult to make, neither are they expensive. The material must be good. Solder for cycle brazing work is of two kinds, and these are generally known as the granulated and the wire forms. The granulated or spelter form

varies considerably. Brazing wire should not be hard and stiff. The softer the wire the easier it will melt and the less danger there will be of overheating the tubing; if the tubing is overheated or burned, the parts are weakened. If the brazing wire is too soft, the joint will be less rigid than it should be. Granulated spelter should be thoroughly washed in water, cleanliness being an important part of the operation.

The spelter can only be made to flow where a flux has preceded it, hence the importance of securing the most serviceable article. Borax is most generally used for a flux, and it may be obtained in several forms, Plain borax is that which has been dried, or borax may have been melted and broken to the form of a coarse powder or granules; this has had all the water taken out of it and thus forms a good covering for the steel, The former bubbles when subjected to heat. The two combined are generally used. The object of the flux is to protect the surfaces of the metal from the flame and to keep it perfectly clean. Without perfect cleanliness, the joint cannot be effected, and no solder can unite the steel surfaces in a metallic union if foreign substances intervene. The borax must be ground to a fine powder. The reason why borax is the best flux is because heat will not evaporate or dissipate it, while it flows almost as readily as water.

The spelter and borax must be mixed together very thoroughly before being put into the joint, and in about equal proportions. A slight excess of borax will do no harm. No two workman mix the ingredients alike; each has a way of his own which he thinks better than any other.

Too much stress cannot be placed upon the vital point of cleanliness of the parts to be brazed. The joints must also be perfect in union. The tighter the joint the better the

spelter will unite the two surfaces. If too tight, some workmen file grooves on the outside of the inner tube. This practice is not commended by good workmen unless the grooves are filed spirally around the tube. The reason why the joints should be tight is that when the plug is so much thicker than the tube, as soon as both get hot enough to melt the spelter, the tube expands enough to let the spelter go in between, so that it is scarcely necessary to have these grooves. Learners should experiment on odd pieces of tubing that have no commercial value, and when they feel that they are efficient, they can do more important work. The tube, if one inch in diameter, should be inserted fully one inch into the lug. The wider the tube the greater the necessity of inserting it further into the lug. Pin the tubes together with wire to hold them firmly in position, for applied heat is apt to change the relation of the parts heated.

Having now progressed far enough, and obtained a joint all ready to braze, we must return to the forge. The best heat obtainable for brazing is gas, and, if possible, natural gas. Gasoline conveys impurities with it into the joints. Gas can be handled to better advantage than anything else, and the heat can be controlled with the greatest ease. A forge fire is apt to burn the tubes. Most repairmen must depend, however, on gasoline; its objections are not insurmountable, and its action is generally satisfactory. We must presuppose that the operator has selected his forge from one of the many in the market, or has made one for himself on approved plans. No man should attempt to make a forge unless he understands some of the principles involved in the work to be done on it. The main point is that it be capable of giving all the necessary heat. A small one will do as good work as a large one, provided the flame from it will cover and thoroughly

heat the joints to be brazed.

Where the bottom of the lug is closed so that the solder cannot run through, it is better to braze from the inside and to insert the charge before heat is applied. An important detail before both ends of a tube are closed, is to bore a small hole in the tube to permit the escape of the gas generated by the spelter and borax. A large teaspoonful of spelter is sufficient for a 1-inch joint; an experienced operator may need more, while a practical workman will use much less. In the case of a closed joint, the spelter must be put in before the tubes are put together, or before the tube is inserted in the lug. The joint is now placed on the table or hearth, where the heat is to be applied, the tube standing erect and built all round with abestos, space only being left to blow the heat down into the joint. Instead of abestos, fire bricks are used by some workmen, those made of cast iron and perforated being preferred to those made of clay. Some build coke on the table and thus surround the joint while under heat. This plan has the same disadvantages, though in a less degree, that the old forge fire has.

The joint must be thoroughly heated through, and the flame kept as constant as possible on all sides of it. On inside brazing it is necessary to begin above the charge and gradually work downward, so that the top of the spelter may be melted first. The steel will soon become a bright red, and the borax, being the first to melt, will convey the spelter into every interstice of the joint. The ability to distinguish between the borax and the spelter will soon come to the novice, and this knowledge can only be gained by experience. More spelter can be added as necessary. A common way is to have a hot wire flattened out and with it pick up more spelter and drop it where necessary, or addition-

al spelter may be dusted on with the fingers, in this case the spelter already in place will not be disturbed.

Having filled the joint thoroughly, it may be taken from the furnace and at once brushed over with a wire brush to remove all the superfluous flux. This may be done with a file, but, as hinted before, the less filing the tube is subjected to the better, besides which this work is ruinous to any file.

In cases where it is necessary to insert a lug inside the tube, the importance of drawing the spelter through until it appears on the outside cannot be emphasized too much. A piece of flattened iron wire, heated to a cherry red and dipped in borax may be applied all around the outside of the joint to advantage, repeating the operation as often as may be necessary. This will invariably draw the spelter through. Usually, however, the tube goes inside the lug, and in this case, while it is next to impossible to make the spelter rise through the joint until it appears on the outside, the workman may remember that it is of less importance in this case, as more spelter can be applied easily, and this will run down and unite with the spelter in the joint. It is very important that the joint shall be thoroughly brazed all the way through and all the way around. Experience alone will guide the worker as to the perfection to which he has attained. It is well to do all the work quietly and coolly. Take time to do it thoroughly. If a little of the spelter is wasted, never mind. In course of time the novice will attain perfection, but it may come slowly. When quite sure that the spelter has filled all parts of the joint—and not till then—the frame can be removed from the furnace, allowing it to cool gradually, and taking care that the parts are not disturbed until the spelter is thoroughly set. To disturb the spelter at this stage means a

bad joint.

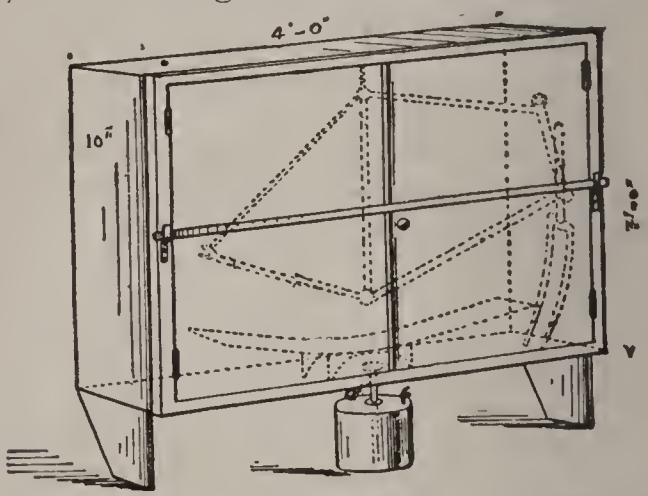
When the bottom of the lug is not closed, it is necessary to braze from the outside only. This is done either with the brazing wire or with a brazing spoon or ladle, in the following manner: Build the fire around the joint as before, but blow the gas on the thickest part of the metal first in order to get it all heated through evenly. The wire or spoon must also be heated thoroughly in order to make it take up the spelter. When the steel has attained a bright cherry red heat, use the spoon to put the spelter into the joint, continuing to blow the gas on both steel and spelter until first the borax and then the brass begins to melt and flow down into the joint. For outside brazing, the mouth of the lug should be filed out to a slightly funneled shape; a small groove will thus be formed serving as a channel in which the spelter will more readily flow, otherwise a large quantity of the spelter will flow over and waste.

Sometimes it may be found necessary or desirable to braze malleable iron and steel together. In this case the same spelter will scarcely accomplish the desired result. Use copper instead of brass, and then proceed as before; the result will be a much stronger joint. Nevertheless it is well to remember that it will require much greater heat in order to accomplish a perfect joint.

### Enameling Oven.

J. W. Cooper, Moline, Ill, sends in details of an enameling oven that should prove of great interest to repairmen. Mr. Cooper made one for himself, and says that any tinner can make one. He writes. "I have an enameling oven that does good work and consider it one of the best things I have in the shop, while it takes but little room. It is clean and can be placed up against the

wall. The dimensions are 8 inches thick by 4 feet 6 inches long and 3 feet high. It is made of No. 20 black iron. The flange on the front is wired all around to stiffen it and to form wire for hinge; doors are flat, with a heavy box bead on the three sides to stiffen them, with enough metal left on one for the




other to lap over and hold tight. The oven doors close against the flange on front of oven and are held close by dropping a 1-inch gas pipe in the lugs. In the bottom of oven is a 6-inch hole, and to prevent the flames striking frame I have a strip of iron 8 inches wide and 3 feet long fastened 4 inches above the hole so as to spread flame. This strip is bent so that ends are about 8 inches above center. I have a small hole in top for my thermometer, so I do not have to open doors to see how hot the oven is. The whole is covered with three thicknesses of abestos paper to hold heat, and I can hold my hand on oven at any time when thermometer is 300°. The oven is heated with a gasoline stove made from a XX 6-quart, deep tin pan. Solder a bottom in close to the wire, then invert pan and put a $\frac{1}{4}$-inch gas pipe through center and extend to within $\frac{1}{2}$-inch of bottom; let the other end extend above the pan about 5 inches and put on an ordinary gasoline

burner. Solder stop-cock in at one edge of pan to connect pump for pressure. The bicyle frame after being enameled is hung in oven, and with heat at 300° can be taken out in two hours when the enamel will be found hard enough for all purposes."

### Another Enameling Oven.

W. Hafer, Augusta, Ky., writes: "My notion of a cheap oven is to take an ordinary cannon stove; take off the top, then take a boiler plate the size you want the bottom of the oven to be. Cut a hole in the center of plate to fit over top of stove; then build outside jacket, using the boiler plate for a bottom, leaving top off jacket. Now build the oven out of No. 22 iron, making oven 8 inches smaller than the jacket. Put legs top and bottom, and each side and back of oven; then set oven inside of the jacket, the legs holding oven and jacket apart, making a space of 4 inches between oven and jacket all around. Now put a top on jacket, making a hole in center of top for the stove pipe. Make two doors, 4 inches thick, to take in whole front of oven. The oven must be tight to prevent the smoke in getting in as it passes up between jacket and oven. I have used an oven of this kind with the best satisfaction for years. It is the cheapest and best oven for a repair shop, and any tinner can make one.

### Removing Dents From Tubes.

To take out a dent in a steel tube, I drill a small hole, say from ten to sixteen Birmingham wire guage, according to size and depth of dent, then cut a thread in the hole and screw in a tool steel plug, letting protrude about 1½ inches, this I grasp with a hand vise and so far have been able to draw the dent back to place without much trouble. I then remove the steel plug and screw in its place a piece of soft iron to fill up the hole. When through I only have a small round

spot to touch up with liquid enamel.

A good plan for taking a dent out of a steel tubing is to drill a small hole on the side of the tube opposite to the dent, using a No. 60 drill, and inserting a round-faced punch through the tube, tapping it lightly and moving the point, until dent is removed. The hole can easily be plugged with brass wire and touched with enamel.

To remove a dent in tube without taking frame apart, drill a small hole in dent, heat dent in forge, slip a spoke (with its end bent into a hook) through the hole and pull out the dented tube. Plug up the hole and file smooth.

### Riding in the Rain

The care a wheel receives largely determines its life. When caught in a shower or obliged to ride in the rain, the wheel should be cleaned as soon as possible; get the water off the nickel work at once and dry by the fire or in the sun. Dampness will soon develop unsightly spots of rust on the best of plating. Keep dust and sand off the chain, or it will destroy itself. If a gritty sound is heard in the bearings, clean at once; sand has found its way to them. If obliged to ride in rain and mud, slacken chain and use plenty of oil. This will often prevent the bending of a rear fork.

### A Warning.

In speaking of the Birmingham, Eng., method of brazing, refers to the use of fluoric acid. The writer of the article in question is an expert, and thoroughly understands the subject and possibly handles this deadly acid under great precautions instinctively. A word of caution is necessary, however, to repairmen. Its fumes deal out death to all animal life; hence the utmost care should be taken in handling fluoric or hydrofluoric acid, even though it be purchased in but quarter-ounce lots.

As soon as a joint is thoroughly brazed, it should be taken from the fire and brushed with a metal brush. A file should not be used; first, because it injures the tubing, and second, because it ruins the file. The habit of some braziers in pickling the joint is objectionable, as acids will invariably prove detrimental to the joint as well as to the steel in the tubing. Every care must be taken to avoid a weakening of the frame in any part. It stands to reason that the acid that will effect the superfluous spelter will also act upon the joint, while a weakening of one part of the tubing weakens the wheel.

All through the various operations it is important that no more heat be applied than is absolutely necessary. The tubes, being thin, burn somewhat readily, and as soon as burning commences, a manifest weakening of the metal is evident.

Screw threads in close proximity to a joint must be protected. This can be done by applying either black lead or clay, graphite or black lead being preferred, as the clay is apt to crack and allow the spelter to unite on the threads; from which it will be found difficult to remove it.

It may be mentioned that there are various substitutes for borax as a flux. Borax has been advised here because it is cheap and readily obtainable anywhere. There are various compounds and preparations, any one of which may or may not be better than borax. Borax makes a good flux, and by its use some of the best examples of brazing have been effected. A great many braziers use and prefer boracic acid. At the recent shows a new substitute for borax was exhibited. These doubtless have some merit, but these papers have dealt with well known and well-tried methods, and have not advised experiments of any kind.

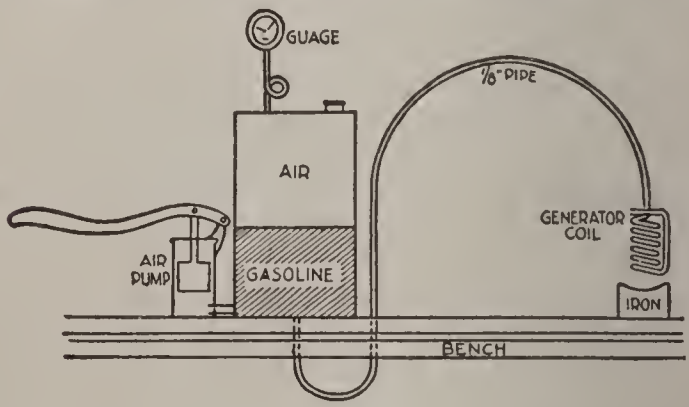
### Continuation of Brazing.

Solidity in a joint results from perfect union only, and all efforts must be directed to accomplish this end. Closely followed, these instructions will place any repairman "on his feet" in the art of brazing, and the rest will be gained by the only successful tutor—experience.

### How to Make a Good Brazier at Little Cost.

Mr. R. R. Walker, of Parsons, Kan., writes as follows:

"Make a tank out of boiler iron that will hold about 6 gallons and stand about 150 pounds pressure; attach an air pump and steam guage to it, also a screw plug on top for filling it. Connect it from the bottom with $\frac{1}{8}$ in. pipe with valve. Run the pipe about 6 feet away from the tank. For a generator and burner, use a common coil of




$\frac{1}{8}$-inch pipe 4 inches long and about 1 inch space on inside; let the flame burn downward on a small cast iron block. With your tank one-half full of gasoline and fifty pounds pressure, it will melt brass in a few minutes, and I find that it is very good for brazing bicycles with and equal to natural gas. I am using one of my own make, and it works finely, and any reader of Wheel Talk who desires more information can have same by addressing me."

No. 1.

No. 2.

Be sure that the needle-plug is screwed fully into the nozzle, so that it will form a smooth, sharp point with the nozzle, before putting it into the puncture. See No. 2.

No. 3.

No. 4.

Do not put the nozzle into the puncture until the tire has been inflated to riding

pressure, and then see that it goes up to the cup. See No. 2.

In unscrewing the needle-plug, see that the air comes out through the nozzle with a strong hissing noise. If no air comes out, the point of the nozzle has not entered the inner tube. See No. 3.

Screw the needle back into the nozzle, and press down firmly, giving the nozzle a screwing turn. Then unscrew the needle, which will permit the air to rush forth.

In filling up the cup with cement, see that it is completely filled, see No. 4, and not merely across the top. Then see that the butt end of the needle-plug is screwed in as far as it will go, so that all the cement will be forced inside the air tube.

It is important that the inflowing cement be forced directly upward, so that it will fall evenly around the puncture. Otherwise the

No. 5.

No. 6.

patch will be made at one side of the puncture instead of directly over it. See No. 5.

Be careful to spread the cement all around the puncture when pressing with the thumb, See No, 7.

After making a repair, test by wetting the

spot. If the air still escapes, partly deflate the tire, and press down firmly once more.

If air escapes slowly after repair is made, do not again insert needle into the puncture, as the second insertion would pierce the patching ply. The air probably escapes from between the casing and the inner tube, and no leakage is likely to be noticed after the tire is fully inflated. If there is a leakage, however, partially deflate the tire and again press upon the punctured spot.

No. 7.

Turn the wheel so the puncture will be at the highest point. Spread the cement by pressure. Then half-inflate the tire and press the spot down to the rim again. Then inflate completely.

Should the rider be unable to locate a puncture it will be because of its small size. As the air will escape very slowly, he will be able to ride home, where he can take out the air tube, put it into water, find the puncture and repair it at leisure.

If the puncture is small, the nozzle may be inserted more readily if its point is wet.

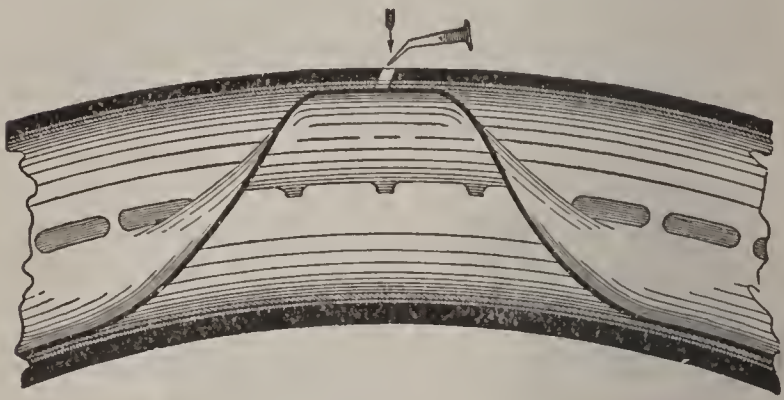
Should other repairs than punctures become necessary, this inner tube can be pulled out of the casing as easily as can the regular inner tube, as no cement gets between tube and casing when the nozzle is used in repairing.

This tire can also be repaired the same as other double tube laced tires.

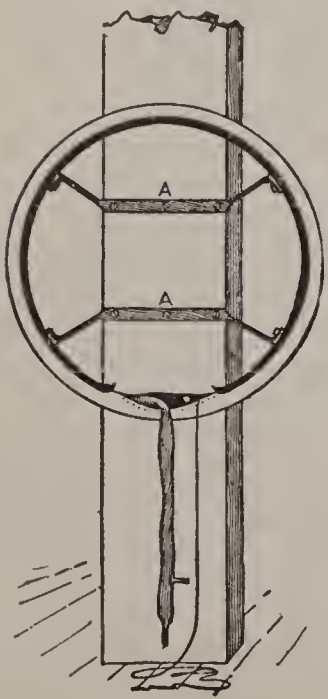
Do not twist the quick-repair tube when

drawing it into the outer casing.

Cement should be about as thick as molasses. Keep cap of tube screwed down tightly, or the cement will evaporate until it is too thick to use.



No. 8.
Side view of repaired tire.




**A Convenient Stand.**

Here is a device which will be found very convenient for holding tire while removing tube. Take a steel rim, cut away a piece and bend slightly at the ends, as shown, Make the two bases A A, rivet them to rim and screw to some convenient post in shop. It will save a world of annoyance in removing tubes.

## GUARANTEE FOR 1896.

We shall continue in 1896 our custom of repairing all tires of our manufacture free of charge.

We shall replace defective parts **when, in our judgment,** the defect is from our fault. **In no case** will we replace when worn out in service or injured by accident.

**Make your request direct to us, and not through the makers of your wheel.**

Express charges on tires must be **prepaid in every instance.** If return by mail is desired, postage at the rate of one cent per ounce must come with request for repairs.

Do not send the wheel with the tire.

See that every package sent has **your address securely fastened to package.**

Before sending to us kindly attempt the repair yourself, so that our efforts may be directed to assist those really in need.

It is a good idea for riders to buy an extra inner tube, complete with valve, and keep same ready for use. The small expense will save delay and insure many a pleasant day's sport.

Any pneumatic tire ever made, or to be made, will some time need repairs, and will ultimately wear out in service. Don't forget this when reading advertisements.

All genuine Morgan & Wright tires have the firm name and the patent dates in raised letters on the side. All others are imitations or infringements, and the public **is warned** against them.

The Morgan & Wright tires are made upon honor, of the very best materials obtainable in the world. They have proved during the past four years to be far the most durable tires ever produced, and have to their credit more hard fought road records and extraordinarily long rides than all other makes put together.

**MORGAN & WRIGHT**

January, 1896.

### To Find a Leak.

Inflate tire and test valve and stem as follows. Immerse valve and stem in bottle or glass of water, the tires being inflated and in position shown in fig. 1. If bubbles form, note carefully where they start. They will show leaks in one of three points—through the valve, between the valve and stem, or through the stem. If valve leaks, pump a

few drops of water through it. If leak continues, attach pump, cut string, pull out valve and insert new plunger or washer. No other part of valve can leak. Wet valve in water before replacing. Tie tight and test again to make sure that there is no leak. If leak is between valve and stem, tie valve in tighter. Do not try to fix a leaky stem—get a new one. Remove stem by working benzine under its base on point of knife, being careful not to cut rubber, or hold a warm piece of iron on base, not hot enough to burn. Clean base of stem and part of tube to which it is to be fastened, by scraping or rubbing with benzine. Apply one or two coats of solution and let dry thoroughly before putting stem in place. Press the stem on so it will stick

**To Fasten Tire Tape.**

Let some of the air out of the tire, wrap tight, then inflate and go ahead. By wrapping it when tight it never sticks so well.

**To Remove Inner Tube.**

Take wheel from machine, deflate tire, and crowd it off wheel, beginning on side opposite valve Notice how tire is laced. Then cut lacing and expose canvas which covers end of inner tube. Peel this off carefully and separate the ends. Hold tire with foot by middle opposite laced portion, and pull the ends of tube till you see that tube is loose from inside of casing as far as the foot. Loosen the other half of tube in same manner. Remove tube by valve end, after carefully replacing the other end in casing so it will not rub against laced portion, holding tire with foot as above and being careful not to compress it between foot and floor. Jerk a little as you pull, but

not too much. If tube sticks, pound tire hard on floor. Loosen each half as before instructed and try again to remove. Do not pour any liquid in casing.

### To Test Inner Tube for Leak.

Inflate tube very carefully and no longer than when inside of casing. Immerse in water, stretching so as to open small holes and make leaks perceptible. Leaks will be shown by bubbles. If you are on the road, with no water handy, stretch tire and pass it close to your cheek, or near dust in the road, and see the effect, thus locating the leak.

### To Patch Inner Tube.

Gently scrape the tube for an inch around leak. Cut patch of sheet rubber the size of scraped surface and clean one side. Apply rubber solution to both cleaned surfaces and let dry until benzine is evaporated. This will take from one to ten minutes, depending on thickness of solution and condition of the air. Apply patch on tube and press the two together until a good joint is formed. Be sure there are no other leaks, and, if tested in water, see that the tube is dry before putting back in casing.

### To Replace Inner Tube In Casing.

If the tube came out hard, drop a handful of powdered soapstone or French chalk inside the casing and shake it all around before putting tube in again. This material can be bought at any drug store. Attach a stone, nail, pocket knife or other weight to one end of a large, soft string and drop into casing. Turn casing so weight will travel around and carry string through. Attach string to end of tube(not valve end), and draw in tube, being careful not to twist. Have ends overlap each other eight or ten inches.

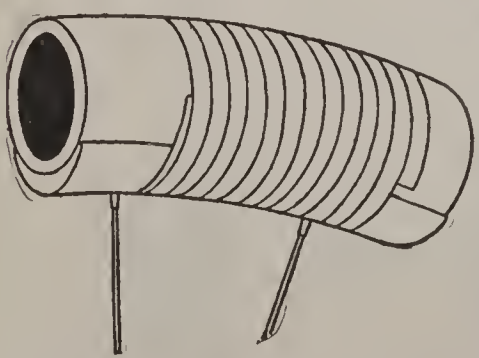
Cover with canvas strip, so tube cannot blow through lace holes. Lace up tire, sewing straight across, same as laced at first. Apply a little solution to old cement on rim, set tire straight and inflate. If experienced in repairing tires you can remove tube without taking tire off wheel by loosening a few inches each side of valve and crowding this off rim (as shown in Fig. 3 and 4.) If tube sticks it will be best to remove tire from wheel, especially when you are miles away from home, where it would be inconvenient to break tube in half.

## TO REPAIR INNER TUBE THROUGH BURST CASING.

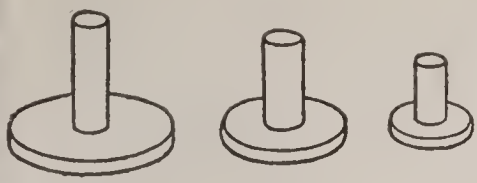
If casing bursts, pull loop of tube through opening, slip stick under to hold it, and patch in regular way. (See Fig. 5 and directions for patching.) Crowd tube back in, partly inflate and bind with tire tape, being sure to cover an inch or two beyond cut on each side. Finish inflating and tube cannot slip. A tire thus repaired can be ridden a long distance.

## SINGLE TUBE TIRES.

The simplest form of temporary repair, and one which, in nine cases out of ten, will serve the rider for the remainder of his trip, is simply an application to the punctnre of a small piece of chewing gum covered by a firm bandage of tape 'round tire and rim over a space of at least one inch on each side of the puncture.

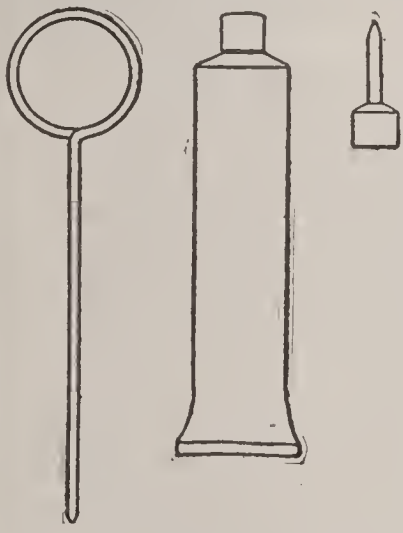


If a temporary repair such as has been described will not suffice to meet the necess-

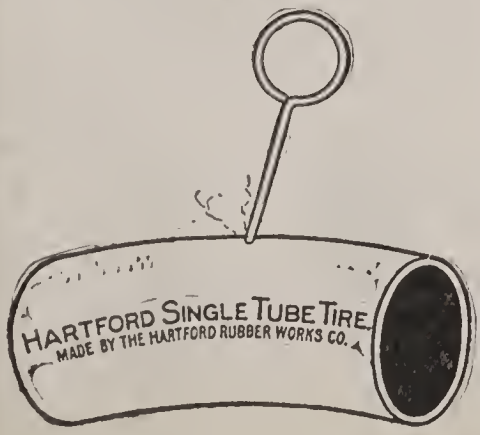


ities of the occasion a permanent repair can be made on the road with as much ease as though at home.

When a tire deflates on the road, examine the valve. If the valve is all right, look for a puncture. This is generally easy to find. Now get out the repair kit, heat the wire probe as highly as possible with a match and

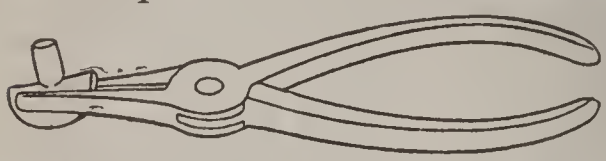


sear the puncture to a smooth, round hole. This is done to provide an even, clean surface, between which and the plug the solution will form a more perfect bond. Now clean the tire about the puncture, inside and out, with a small piece of rag held in the pliers; take a rubber plug of the proper size and grasp it with the pliers as shown, having previously attached a string to the stem as a safeguard against losing the plug inside the tire while withdrawing the pliers; cover plug and plier tips



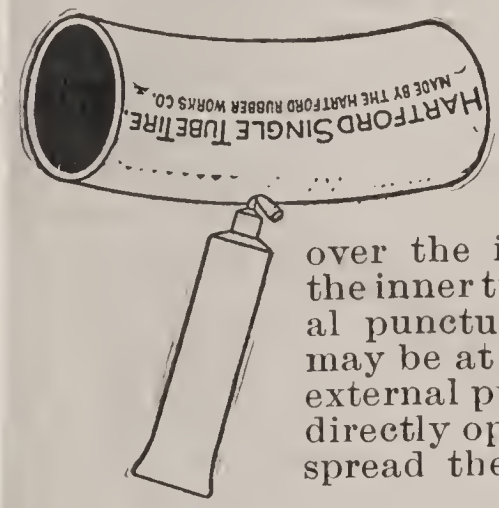

well with the solution, and push the plug firmly into the puncture until all but the stem has disappeared. Next withdraw the pliers simply releasing the pressure of the grasp and pulling them out of the tire; the string safe-

guard may or may not have been of use, but it is best to be on the safe side. Now screw the sharp pointed nipple on to the solution tube, insert it through the puncture hole beside the plug stem; turn the wheel so that the puncture is at the bottom, and then squeeze about one-eighth of the solution into the tire. Withdraw the nipple and, grasping the plug stem with finger and thumb or pliers, twist the plug around several times so as to spread the solution evenly about the patch. Now inflate the tire, keeping the puncture at the bottom of the wheel, and allow it to stand in that position, if possible, for about five minutes, so that all the solution injected may settle closely around the edge of the patch. At the end of the five minutes specified, test the repair for a leak; if air-tight, cut of the plug stem just above the tire surface, and the tire is ready for use. If the repairs is not perfect, deflate the tire, inject a little more solution, observing the previous directions on this subject, and let the wheel stand again, puncture at bottom, as before.




Occasionally when a tire is punctured by a nail or other sharp object, this penetrates the opposite wall of the tire. As a rule the puncture is through the inner tube to the canvas only; but this is sufficient to allow the air to escape along the threads. This internal

puncture on the rim side of the tire should, if suspected, receive attention before the real puncture is repaired. A liberal supply of solution applied with the external puncture at the highest point, instead of at the lowest as is usual, will remedy the trouble. After inserting the solution, press the walls of the tire together, and with a rolling motion distribute the solution over the interior. This forces the solution into the minute openings, and as the solution evaporates it forms a thin airtight coating




over the injured portion of the inner tube. As the internal puncture in some cases may be at an angle from the external puncture, instead of directly opposite, it is well to spread the solution injected over a fair sized surface by pressing and rubbing the walls together as above explained. The external puncture should then be repaired in the ordinary way.

Should the tire, when inflated after being repaired as above, still show evidence of a leak, it is apparent that the object creating the puncture has penetrated deeply into the opposite wall, and has lacerated the fabric too seriously for the solution to repair. It is necessary to find this weak spot by first rolling the tire from the rim and then taking a blunt probe and pressing firm upon

the under surface of the inflated tire. With a little care and persistence the puncture will be located, as the probe will suddenly penetrate the outer covering of rubber wherever the fabric has been injured, and a sudden rush of air will announce the discovery. It will then be necessary to insert a plug as described for the repair of ordinary punctures, and the tire can then be cemented to the rim in the usual manner.

Unless such interior puncture be repaired as described, the air will work along the threads of the fabric and emerge at every slight opening in the outer wall, almost giving the impression that the tire is porous. This form of puncture rarely occurs, but it is well to warn against it.

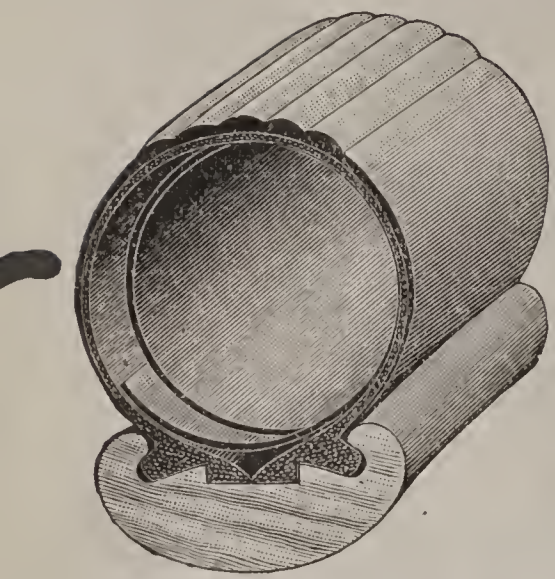
When possible, it is really advisable to allow a repaired tire to stand for fifteen minutes, but in an emergency this may be omitted. The solution furnished in their repair kit is of the proper composition and consistency and should be used in preference to all others. These directions will answer for all single tube tires.

### To Patch a Large Hole.

A hole in the outer casing of a double-tube tire may be patched by inserting a single-tube patching plug the same way you would in a single-tube tire.

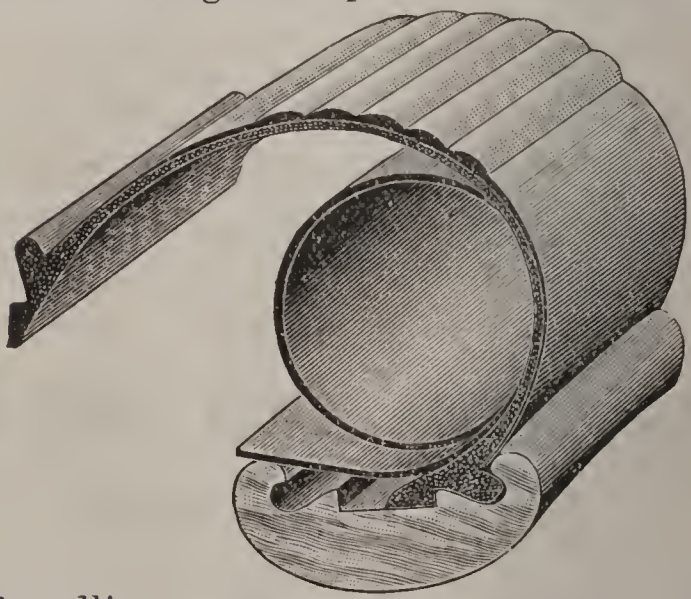
When an outer casing is cut badly or broken at joint, repair it as follows: Slit shoe open on under side so as to give room to get at part cut; take a glovers needle and stitch up, using baseball stitch, and not stitching through rubber but taking good, deep stitch through canvas. Cement outside with tube cement, and shoe will last as long there as any part of tire.

## 1896 G. & J. TIRES.



The 1896 G. & J. tire is exactly like that of the past year, excepting that a wide stiffened flap is provided which absolutely protects the air tube from being pinched or punctured by spoke joints and nipple heads.

The following description of the method



of handling will make the change clear. Place the edge of the outer case having the wide flap in its place in the rim first.

Next insert the valve and lay the air tube on top of the flap, all the way round. The air should be all extracted from the tube before it is put in place. Push the remaining edge of the outer cover under the flap, (which

projects slightly over the rim) and firmly into its place in the rim. The corrugations have also been modified from three to five, thus providing a thickened thread without the stiffness of surface that has heretofore been considered unavoidable. The same wood rim used in 1896 that has proven so successful in the year past.

### To Repair a Puncture.

Inflate the tire and examine the outside carefully, to find the place where the puncture occurred, if possible.

It is not necessary to remove the wheel from the bicycle,

In most cases the puncture may be easily found in the outer case, as the air makes a slight hissing sound in escaping. Care should be exercised, however, as a very small hole is sufficient to let out the air, and may be easily overlooked.

Having found the puncture, if there is air left in the tire, deflate entirely at the valve.

Grasp the tire from the right side, one hand each side of the puncture.

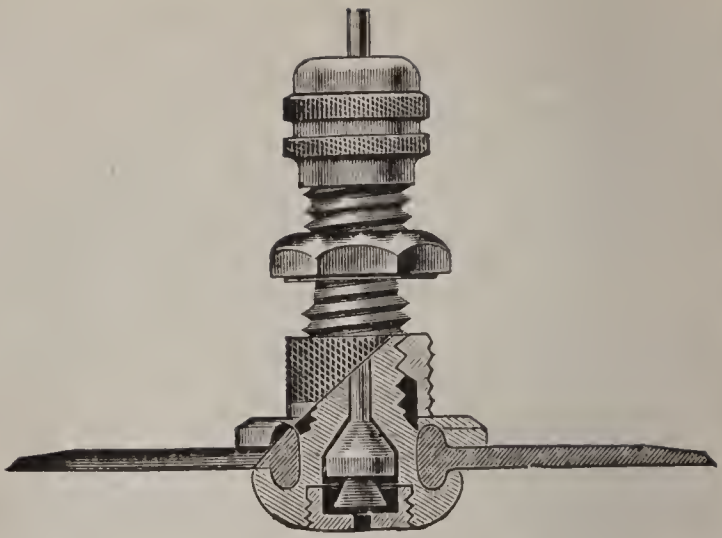
Observe that on the left side is lettered on the tire, "Apply this edge last, and remove it first."

Push with thumbs, raising the locking edge free from the rim at the same time. The edge should be freed for a distance of one or two feet. Draw the whole tire towards you until the near edge of the outer case slips out over the rim.

The inner tube can now be easily pulled down and out.

It is not necessary to pull off the whole tire. If the puncture cannot be found, remove the entire right side of the outer case from the rim, and draw out the inner tube.

Don't take the wheel out of the frame to



If there is a leak at the valve the trouble must be where it is fastened to the air tube, or at the cap.

**To Find a Leak in the Cap.**

Insert the valve stem in the neck of a bottle or glass filled with water, if convenient or wet the joint of the cap with soap water or saliva. If bubbles occur, remove the cap and turn the packing. If this does not stop the leak, the packing is worn and should be renewed.

The packing in the cap seats on top of the valve stem, thus preventing the escape of air. It should seat evenly and tightly all around.

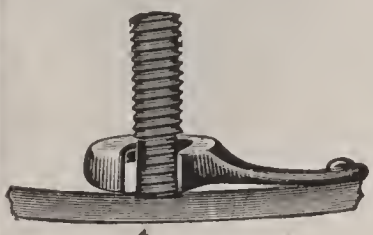
If the leak occurs at the point where the valve is joined to the tube, the valve washer is either torn, and should be replaced, or the valve is not screwed tightly to it.

Sometimes the valve will not admit air, or allows the air to rush out when pump is removed. This is because the air passage in the stem is stopped up with dirt, or the check valve sticks. Unscrew the nut at the bottom (a silver dime makes a good screw-driver) and take out the check valve. Clean the hole in the stem with a piece of twine, wipe the valve seat and rubber check, and no more trouble will occur.

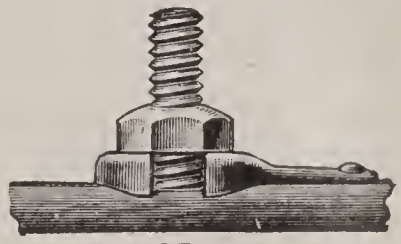
get a tire off—remove only the left axle nut and spring up the frame or fork.

To remove the valve (which is attached to the inner tube),

Open the latch. Unscrew the cap. Remove the check nut.



No. 1.



No. 2.

Push the valve stem through the rim. Do not try to pull it by means of the air tube. The inner tube now being free, screw on the pump and partly inflate the inner tube. A little larger than the natural size of the tire. Take enough water (in a basin or bucket, if no other means are convenient) to entirely cover a section of the tube. Submit the entire length to the test, a portion of the time, including the valve, stretching the sides of the tube with the fingers to enlarge any supposed opening.

Whenever a small stream of bubbles arises there is a leak. If no water is near, pass inflated tube past the ear and listen for a hissing sound, indicating an escape of air.

Mark the place well; dry the tube and repair. The repair patch won't stick if the tube is not dry when it is applied.

### The Valve

Is very simple, and there is no part of it that cannot be gotten at readily by anybody. It is practically a hollow brass stem with a check valve to keep the air from rushing out when the pump is removed, before the cap can be screwed on; and a cap which permanently prevents the escape of air. The following description should enable anyone to correct any difficulty that may occur.

### The Rule of the Road.

While it is perfectly true that wheelmen are subjected to great inconveniences and wrongs by road hogs in heavier vehicles, this is no excuse for those riders who habitually disregard the rules of the road themselves and place the lives and limbs of themselves and others in jeopardy. This inexcusable carelessness or ignorance on the part of cyclists is responsible for most of the accidents chargeable to the bicycle.

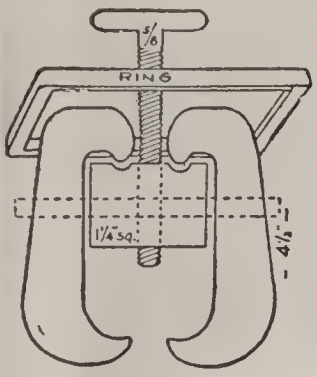
A carriage driver or horseman who should fail to turn to the right on meeting another carriage or horseman, or who should go sometimes one way and sometimes the other, could not complain if he came to grief on the road, or if he was mulcted in heavy damages for accidents caused to others. Why, then, should bicycle riders be permitted to dodge hither and thither on the road, disconcerting drivers, riders and pedestrians? The rules of the road are made for all and should be obeyed by all, irrespective of their personality, their position or the particular kind of mount on which they offended.

It is to wheelmen one should look for good examples of citizenship, for they are generally accredited with the possession of sound sense.

### A Makeshift Chain Adjustment.

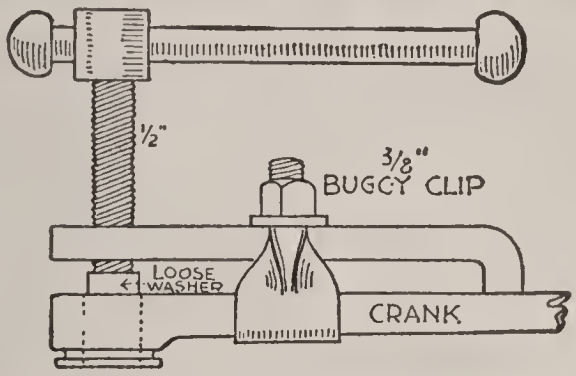
A rider whose chain stretched to an extent utterly impossible in an ordinary well behaved machine, found that the screw of the adjustment had become hopelessly bent, and therefore the nut would not move either up or down. So cutting a piece of wood to the required size and shape he fixed the slot of the backstay at the length required to hold the spindle in position, and screwing up the spindle nut effected a perfectly satisfactory adjustment. Indeed, the wheel ran for some weeks with that piece of wood holding it in.

### A New Crank Puller.



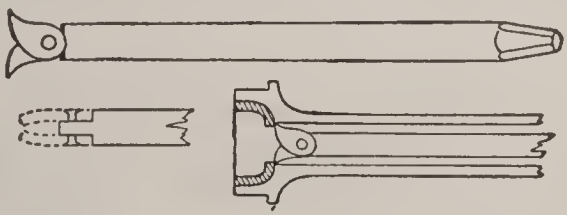

I have not failed to oust anything in the shape of a crank that has come into my shop. The screw is ⅝-inch, and has a handle 6 inches long, welded on. Screws and nuts are machine steel; the jaws are of the best tool steel, and the ring is Norway, ⅝ x ⅝, and large enough to slip on over the outside of the jams, which taper toward the top end. The Ouster fits them all except the Victor.

### Crank Puller.




The sketch explains itself.

### Removing Cups.



C. C. Bostwick, Pataskala, O., sends sketch of tool he uses for removing cups from hubs. He also shows section of hub to explain how it works.

### 3 in 1.

Having used 3 in 1, I find it the best thing for purpose intended. (See adv.)

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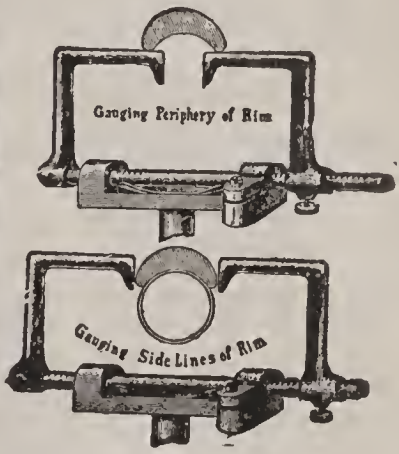


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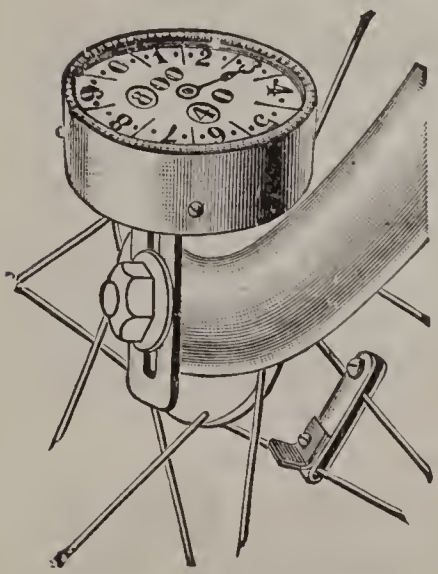

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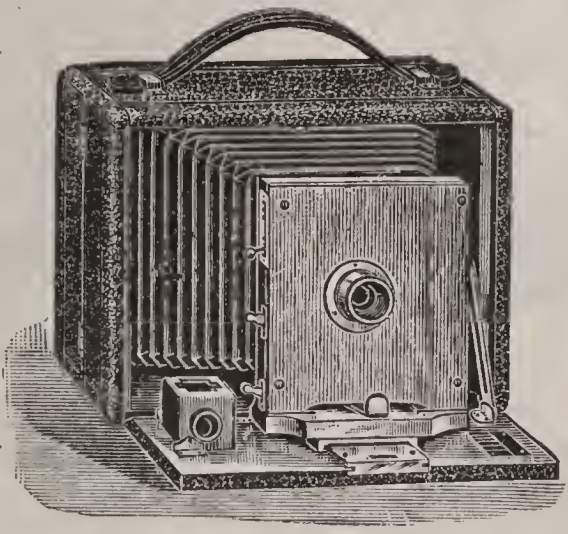

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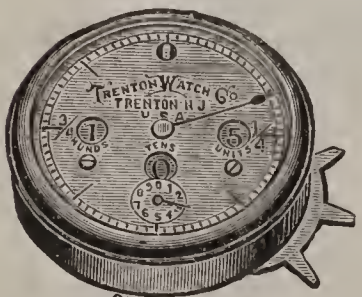


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